

CHEMICAL ABSTRACTS

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1—APPARATUS

C. G. DERICK

Cleaning and keeping clean volumetric apparatus. F. W. HORST. *Chem.-Ztg.* 45, 604(1921).—A strong soln. of NaMnO_4 slightly acidified with H_2SO_4 is best for cleaning oil or grease from burets, etc. Standing for 30 min. will completely clean such app., and in many cases it is only necessary to swab them out with an asbestos or glass wool swab moistened with the soln. The sources of the oil film are: rinsing out the app. with tap H_2O , prepns. of reagents in app. that has been rinsed with tap H_2O , the use of condensate H_2O for the prepns. of such solns., inverting burets to empty quickly (they should be emptied through the cock), closing the flask with the hand when mixing solns., running solns. not used back into the stock bottle, and vapors from oil baths.

J. H. MOORE

Stirring device for experiments under vacuum, vacuum distillation, and for experiments with gases under pressure. E. HUGEL. Brake. *Chem.-Ztg.* 45, 604-5 (1921).—A description, with two cuts, of a stirrer for use in flasks. J. H. MOORE

A new absorption vessel for elementary analysis. WALZ. Jena. *Chem.-Ztg.* 45, 658(1921).—The app. resembles a small graduate with hollow, ground stopper, the lower end of the stopper being drawn down to a tube which delivers the gas nearly at the bottom of the app. Entrance and exit tubes are fused to opposite sides of the neck and through a hole in 1 side of the stopper the gas enters the app. and passes to the exit tube through a groove in the stopper opposite the hole. The wt. when filled with CaCl_2 or soda-lime is about 35 g. J. H. MOORE

New apparatus for preserving substances under vacuum, as well as for opening and closing under vacuum glass vessels sealed with rubber rings. OSKAR LOBECK. Leipzig. *Chem.-Ztg.* 45, 651-2(1921).—The app. consists of a metal cylinder, open at the top, with vacuum pump, gage, and cock for breaking the vacuum attached. A groove around the top contains a rubber ring on which a glass bell is inverted when the app. is in use. The substance to be preserved is placed in a vessel with rubber ring seal, such as a fruit jar with glass top, with the cover in place, the vessel placed in the metal cylinder, the bell inverted over it and the app. exhausted. On readmitting air the pressure seals the vessel. To open it a spring clamp is placed at the point of contact between the rubber ring and top, the vessel placed in the app., which is again exhausted. When the original vacuum is reached the spring slips under the cover and prevents a seal when air is again admitted. J. H. MOORE

Stoneware machines, pumps and exhausters. FR. MÜLLER. Friedrichsfeld. *Z. angew. Chem.* 34, Aufsatzteil, 291-2(1921).—A general paper read at the meeting of the Ger. Chem. Soc. in Stuttgart. J. H. MOORE

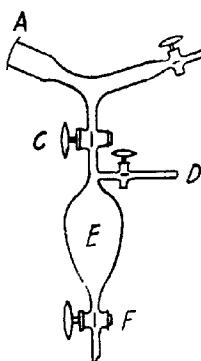
Determination of the combustibles in gas mixtures. TH. KALETA. Dortmund. *Chem.-Ztg.* 45, 651-2(1921).—With the common explosion pipet only a part of the gas residue is taken for the detn. of H and CH_4 . In K.'s app. (made by Carl Goerck, Dortmund) a heated Pt spiral is substituted for the elec. spark in the explosion pipet and the entire residue is burned in an atm. of O. A measured vol. of O is run into the

pipet, the spiral heated and the gas residue passed in carefully through a capillary tube that causes it to impinge on the hot spiral. The burning takes place smoothly and with a visible flame. The analysis is completed in the usual way. In some gases CO may be detd. in the same way. Three cuts are given.

J. H. MOORE

The efficiency of several types of fractionating apparatus for distillation in vacuum. Several laboratory observations. L. SMITH. *J. prakt. Chem.* 102, 295-304 (1921).—Using 11 types of fractionating app., all of which are fully described, to conduct the fractional distn. of a mixt. of isomeric glycerol monochlorhydrin, it was found that the most efficient sepn. of the isomers, whose b. ps. differ by only 5.5° , is made with the "disc and rod" or "Vigreux" with 8 units types.

G. L. CLARK



A new vacuum receiver. WILHELM KOHEN. *Chem. Ztg.* 45, 638 (1921).—A is attached to the cooler and B to the vacuum line. With D and F closed the desired vacuum is established in the retort and the receiver E and the distn. started. When the desired fraction has collected in E, C is closed, D opened and the fraction discharged through F. F is then closed, the vacuum again established in E through D, which is then closed and C opened for the next fraction. This may be continued as long as desired without breaking the vacuum in the retort.

J. H. MOORE

Uniform high temperature throughout a large volume. E. F. NORTHRUP. *J. Ind. Eng. Chem.* 13, 639 (1921); 1 cut.—App. is described for the study of refractories at temps. exceeding 2000° , in vols. up to 1 cu. ft. It consists of a graphite crucible, thermally insulated with lamp-black, and fitted with graphite cover and tube for

optical measurement of temp. This is enclosed in a micanite cylinder, kept at room temp. on the outside by a water-cooled copper coil. Advantages are: perfect temp. control and possibility of studying crushing strength of refractories at very high temps. T. F. B.

A new heating microscope for high temperatures with synchronous revolving nicols. K. ENDELL. Berlin. *Z. Krist.* 56, 191-3 (1921).—Description of a relatively simple app., made by Leitz. It is useful in detg. m. ps., in observing sintering in portland cement mixts., ore-flux mixts., etc., and in the study of changes in glasses and enamels.

E. T. WHERRY

The pyrometer from the standpoint of the user. ARTHUR N. ARMITAGE. *Trans. Am. Soc. Steel Treat.* 1, 651-3 (1921).—Practical suggestions of construction, standardization and operation. An elec. weld gives better results than an acetylene weld for couples. Dry fire clay in the protecting tubes increases the life of iron-constantan couples.

W. A. MUDGE

Carbon dioxide indicator of simple design and rugged construction. ANON. *Elec. Rev.* (Chicago) 79, 218 (1921).—The instrument worked by a minute jet of steam continuously aspirates gases from the flue to which it is connected. The gas drawn through an Al filter passes into a chamber of the indicator with a porous pot inside contg. a dry reagent. A pipe connects the chamber with a vessel contg. water into which dips one end of a second pipe, the other end of which is taken into the porous pot. Some gas penetrates into the interior of this pot and is absorbed by the reagent, causing partial vacuum and the colored liquor rises in the glass tube calibrated in percentages of CO_2 , which may be read at considerable distance. Renewal cartridges inserted once in 24 hrs. maintain the instrument in continuous operating condition.

L. C. KRUEGER

Viscosimeters. F. WILBUR SHULENBERGER. *Paint, Oil, Chem. Rev.* **72**, No. 3, 10-11, 13-14(1921).—There is a general discussion of the measurement of viscosity and a brief description of the following types of viscosimeters: Scott, Engler, Redwood, Saybolt Universal, Saybolt Furol, Gardner and Holdt Bubble, Stormer, and Doolittle.

EUGENE C. BINGHAM

A new vibrating type of alternating-current rectifier for the laboratory. CARL HUETTER. *Elektrochem. Z.* **27**, 101-3(1921).—Description of a small mechanical rectifier especially applicable in connection with electrolytic Cu, etc., detns. in factories where only a. c. is available. This rectifier is rated at 5 amp. and 30 v. d. c.; it is more efficient and less costly than either a motor-generator set or a Hg-arc rectifier. C. G. F.

Methods and appliances used at the Cryogenic Laboratory. XVIII. Improved form of a hydrogen-vapor cryostat for temperatures between -217° and -253° . H. KAMERLINGH ONNES AND C. A. CROMMELIN. *Verslagen Akad. Wetenschappen, Amsterdam* **29**, 915-51(1921).—The improved cryostat described showed a max. temp. variation of 0.01° .

GEORGE W. MOREY

Air heater "Thermix." E. SAJILLARD. *Suppl. Circ. hebdom. synd. fabr. sucre* June 5, 1921; *Deut. Zuckerind.* **46**, 441-2(1921).—This app. is used for preheating the air entering the boiler furnaces. In expts. on a water-tube boiler the CO_2 in the flue gases was raised from 7.87% to 10%, and their temp. lowered from $300-20^{\circ}$ to $220-44^{\circ}$. No description is given of the app.

F. W. ZERBAN

Improvements in Soxhlet extraction apparatus. F. SIMON. Berlin-Pankow. *Chem. Ztg.* **45**, 592(1921); 2 cuts.—An app. is shown consisting of a straight, vertical tube drawn down at the lower end to a wide stem that passes through the stopper in the boiling flask. The upper end of the tube carries a stopper and cooler. The substance is placed in a Gooch crucible standing on a ledge near the bottom of the tube: the condensate drops into the crucible and returns to the flask. The 2nd app. is like the Soxhlet app. with the siphon bent downward, then up to form a U seal, then downward, then at a right angle into the stem entering the boiling flask. At the point where the right-angle turn is made a side-tube with cock is attached for drawing off the solvent. Cf. *C. A.* **15**, 1281.

J. H. MOORE

Improvements in Soxhlet extraction apparatus. OSKAR HAGEN. *Chem. Ztg.* **45**, 592(1921).—Comments on his own and S.'s app. Also in *Z. angew. Chem.* **34**, Aufsatzteil, 499-500(1921).

J. H. MOORE

The Sly dust arrester for filtering purposes. ANON. *Elec. Rev.* (Chicago) **79**, 290(1921).—The dust-laden air is filtered through cloth screens. Large cloth areas are fitted into comparatively small space in such a manner that the effectiveness is at a max. A large open chamber is provided, so that the velocity of the dust-laden air entering the arrester at comparatively high velocity may be reduced to a min. so most of the dust particles will drop immediately and not overload the filter cloth, which in this manner collects only the finest floating particles. The entire construction is weather-proof.

C. G. F.

Mercury vacuum pump. M. G. RANQUE. *Compt. rend.* **172**, 1653-4(1921).—A description is given of a simple, vertical glass app. about 40 cm. in length, consisting of three 2-mm. tubes and a 12-mm. reservoir for Hg, connected by stopcocks. The tubes are so arranged that the difference in heights of the Hg columns causes a rapid descent of Hg past the junction of the tube leading to the receptacle, thus carrying the air with it. The pump operates with about 400 g. Hg, and produces cathodic vacuum in a 50-cc. vessel in 15 mins. after starting with vacuum of 200 mms. It is possible to fill the vessel with any desired gas after evacuation. To discontinue the operation, the 3 stopcocks are closed in specified order. Principal features: Reduced

bore, compact construction, and an auxiliary vacuum of only 60-80 mm. It is recommended primarily for labs. of limited means. T. F. BUEHRER

A new principle of rotary pump construction. S. H. FARKAS. *Chem. Met. Eng.* 24, 1025-6(1921).—The pump has 2 rotors, one essentially triangular, the other essentially square. As the members rotate the vertexes of the triangular piece enter in turn the corners of the square, forcing out the liquid therein contained. Consuming 6-7 h. p., the pump at 1000 r. p. m. delivers about 100 gal./min. with 6.5 ft. suction and 195 ft. head; efficiency is about 75%. DONALD W. MACARDLE

An easily constructed and-cheap buret holder. ERWIN PINOFF. *Chem. Ztg.* 45, 566(1921).—A cork about 6 cm. diam. is bored to fit the buret and 3 steel or Al pins 30-40 cm. long are stuck in the cork for legs. A cork 10 cm. in diam. will hold 2 burets. J. H. MOORE

Modern filtering apparatus. HERMANN RABE. Charlottenburg. *Chem. Ztg.* 45, 501-4, 532-4(1921).—Brief descriptions, with 14 cuts, of the Kelly and Sweetland filter-presses, of the de Häen, Plauson and Passburg ultra-filters, of vacuum filters, hydraulic presses, Heine centrifugals, sand filters, filters with air pressure, and the special H₂O-purification Berkefeld and Hansa filters. J. H. MOORE

Boiler furnace construction according to Bergmans. BREIDENBACH. *Deut. Zuckerind.* 46, 346-8(1921).—A detailed description is given of this furnace for which a better fuel utilization is claimed. Illustrated. F. W. ZERBAN

Boron and silicon chemistry. Experimental investigation of very volatile material (STOCK) 6. Vacuum drying (LAVETTI, VAN MARLE) 13. Study of the fundamental laws of filtration using plant-scale equipment (BAKER) 13. Multiple-effect evaporation (DUNCLINSON) 13. Researches with a flame of exceptionally high temperature (HAUSER, RUE) 2. The importance of the back-pressure steam engine for the chemical industry (BÜRK) 13. Distillation methods and accomplishments in separation (FRANK) 13.

BOLTON, HENRY CARRINGTON: Evolution of the Thermometer. Easton, Pa: The Chemical Publishing Co. 96 pp. \$1.

JAKOBI, S: Technische Chemie für Maschinenbauschulen. Berlin: Verlag Julius Springer. 160 pp. M 11. For review see *Elektrotech. Z.* 42, 838(1921).

Apparatus for destructive distillation. C. A. NOTTINGHAM AND C. TUHEY. U. S. 1,379,876, May 31. Material such as corn-cobs is destructively distd. while passing successively through superposed horizontal tubular retorts provided with conveying screws.

Water-distilling apparatus. C. E. KELLS. U. S. 1,379,631, May 31. The receiver for distd. H₂O is supported on a counterbalanced arm, the motion of which cuts off the fuel supply to a gas burner under the still when a certain amt. of distd. H₂O has accumulated in the receiver. A signal bell is also rung automatically when the fuel supply is thus discontinued.

Gas-analyzing apparatus. O. RODHE. U. S. 1,380,160, May 31. Two or more measuring vessels for the gas are provided, which are alternately used.

Method of operating optical pyrometers. E. A. KEELER. U. S. 1,379,188, May 24.

2—GENERAL AND PHYSICAL CHEMISTRY

W. E. HENDERSON AND EDWARD MACK

The organization of research in the Federal Service. C. L. ALSBERG. *Cotton Oil Press* 5, No. 3, 39-41(1921).—Congress appropriates little money for fundamental

research. Almost all appropriations are made for the solution of some specific practical problem. This is wrong as the primary function of any government with reference to research is to carry on fundamental research. Such research does not necessarily yield immediate money returns and therefore the industries seldom undertake it. Only the government is really rich enough and enduring enough to carry out properly fundamental research and it is the gov. and the university investigators who should furnish new fundamental principles to be applied to industry. So long as the gov. does not recognize that its research should be fundamental, there should be a reorganization of the research work based on commodities and specific fields. Instead of one Bureau of Chemistry as advocated by some each division dealing with a particular industry should have its chemical force to handle the chemistry of that industry's problems. Regulatory laws should be administered by those bureaus that are familiar with the conditions of production of the various articles covered by the laws. Then they will be handled constructively and be of great value in eradicating unfair competition and thus help the entire industry and the consumer.

H. S. BAILEY

Direct research and direct results. G. A. PERCIVAL. *Beama* 8, 524-7(1921).—A strong appeal for the encouragement of research. Examples are cited of classical researches, such as the development of W steel, the discovery and final com. utilization of A, etc. "No country is ever stationary; it goes forward or backward; it cannot go forward without research. . . . Although research may be pursued without consideration of material return, a material return always results in the long run, although it may not perhaps benefit its originator. . . . Americans appreciate the value of new things and make the most of them, perhaps for the purpose of their country's welfare, perhaps for other reasons."

C. G. F.

Recent advances in science—Physical chemistry. W. E. GARNER. Univ. London. *Science Progress* 16, 10-4(1921); cf. *C. A.* 15, 2381.—The following subjects are discussed: The Lewis-Langmuir theory of valence, metallic hydrides, periodic phenomena in electrolysis, ultramicroscopic structure of soaps, and surface tension of solns. of fatty acids.

JOSEPH S. HEPBURN

Standardization and research. S. W. STRATTON. *J. Ind. Eng. Chem.* 13, 727-8 (1921).

E. H.

Some present aspects of chemistry in the United States. B. F. LOVELACE. *Science* 54, 129-40(1921).—A discussion of the recent development of chemistry in the U. S. and particularly of the relation of the university to the new conditions.

E. H.

Colloid chemistry: A misnomer. V. COFMAN. *Chem. Age (London)* 5, 90(1921).—A review of the literature shows that most of the phenomena and properties described under such headings as "colloid chemistry" or "the chemistry of colloids" are physical and not chem. While there are colloid-chem. problems, such as some of the phenomena of catalysis and of adsorption, the term "chemical" should not be applied to all colloid phenomena.

E. H.

The contributions of the different countries to the development of chemistry. B. L. VANZETTI. *Scientia* 30, 85-102(1921).

E. H.

Alexander Bauer. FRIEDERICH BÖCK. *Oesterr. Chem. Ztg.* 24, 99-104(1921).—Obituary with portrait and bibliography.

E. H.

Nomographs for chemists. J. BABINI. *Anales soc. quim. Argentina* 9, 34-43 (1921).—The methods of calcg. and plotting nomographs are explained in detail and two examples are illustrated.

L. E. GILSON

Crystal structure and the construction of the atom. P. NIGGLI. Zurich. *Z. Krist.* 56, 12-45, 167-90(1921).—In studying the relations of chem. compn. to crystal structure it is important to consider not only the arrangement of the atoms but also their symmetry. Thus CaCO_3 and $\text{Ag}_3(\text{AsS}_3)_2$ are crystallographically related,

but the latter is hemimorphic, lacking a center of symmetry, which is to be ascribed to the fact that the group Ca^{++} of the first compd. may well be centrosymmetrical itself, while the group Ag_3^{+++} can not be. The fact that PbS is holohedral, while KCl which has the same crystal structure is not, indicates that either K^+ or Cl^- or both are lacking in symmetry center. The at. figure changes with the temp. and pressure, and from one compd. to another so it must be remembered that the properties of a given atom are individual for each compd. Vol. relations of individual atoms can be worked out from study of isomorphous series. Tables are given showing the sp. gr., equiv. wt., and equiv. vol., for a number of series: (1), K^+ , Rb^+ , Cs^+ and Tl^+ in 34 different salts; (2) Li^+ , Na^+ , K^+ and Rb^+ in 11 salts; (3) Na^+ , Cu^+ , Ag^+ and Au^+ in 10; (4) Ca^{++} , Sr^{++} , Ba^{++} , and Pb^{++} in 20; (5) Mg^{++} , Zn^{++} , Cu^{++} , Ni^{++} , Co^{++} , Fe^{++} , Mn^{++} , Ca^{++} , and Cd^{++} in 41; (6) Al^{+++} , Ga^{+++} , Fe^{+++} , Mn^{+++} , Cr^{+++} , V^{+++} , In^{+++} , and Tl^{+++} in 16, with also Ti^{+++} , Sc^{+++} , Co^{+++} , Ir^{+++} in a few others; (7) Y^{+++} , Yb^{+++} , Er^{+++} , Gd^{+++} , Sm^{+++} , Nd^{+++} (Pr^{+++}), Ce^{+++} , and La^{+++} in 15; (8) P^{+++} , As^{+++} , Sb^{+++} , and Bi^{+++} in 6; (9a) Si^{++++} , Mn^{++++} , Ti^{++++} , Sn^{++++} , Ru^{++++} , Mo^{++++} , Zr^{++++} , and Pb^{++++} in 4; (9b) Ge^{++++} , Te^{++++} , Ce^{++++} , U^{++++} , Th^{++++} , C^{++++} , and S^{++++} in 1-2 each; (10) Si^{++++} , Ti^{++++} , Pt^{++++} , Pd^{++++} , and Sn^{++++} in 2-6 each; (11) P^{+++++} (O_4), As^{+++++} (O_4), and V^{+++++} (O_4) in 11 (the last in 1); (12) N^{+++++} (O_3), Cl^{+++++} (O_3) and Br^{+++++} (O_3) in 5 (the 1st in 1); (13) S^{++++++} (O_4), Cr^{++++++} (O_4), and Se^{++++++} (O_4) in 18; and (14) Cl^{++++++} (O_4), Mn^{++++++} (O_4), and I^{++++++} (O_4) in 2-3 each. In some cases the results are rendered imperfect by inaccurate sp. gr. detns., and new detns. on many salts are called for. The at. vol. relations in the best characterized compds. are very striking. In a closely related series of elements, as the alkalies, the at. vol. increases regularly with the at. no., but from one series to another the relation is variable; thus Tl (80) has the same at. vol. as Rb (36) and decidedly less than Cs (54). Some of these results have been obtained by others, but the periodicity of the phenomena of at. vol. is here for the first time fully brought out. The vol. relations are evidently directly connected with the shells of electrons in each kind of atom. A table is given on the general plan of the periodic system, showing the at. vol. relations of most of the elements. At. vols. are directly connected with the no. of electrons and their arrangement in each kind of atom. Calcs. of at. diams. from X-ray measurements by Bragg (*C. A.* 14, 3584-3585) have given results agreeing closely with those obtained by N. on the entirely different basis here presented. In applying these results to the interpretation of isomorphism, it is first recognized that statistics now available indicate clearly that substances crystg. in the more symmetrical systems are dominantly very simple in structure; that those crystg. in trigonal form often have the numbers 3, 6, or 9 in the ratios of their constituent elements or groups, and those in tetragonal form the nos. 4 or 8. There is thus a very definite relation between the symmetry of the constituent groups and that of the crystal. Extending this to specific cases where substances are crystallographically similar although chemically dissimilar, it is to be concluded that isomorphism is more a phenomenon of geometrical than of chem. relationship. "Only since chemically related substances, because of this very relationship, yield geometrically similar types of compds., do we find isomorphism predominantly connected with the groups of related elements of the periodic system." Langmuir (*C. A.* 13, 2622-2623) holds that isosterism or possession of equal nos. of electrons is necessary for compds. to show isomorphism, but N. points out that this is not the case. Tabulations of at. diams. show that the univalent alkali atoms have the largest spheres of influence, next the bivalent, and finally atoms of other valences. A diagram is given, based on Bragg's, showing that there is marked periodicity in at. vol. relations. Isomorphism often occurs where unexpected, and is lacking where predicted.

E. T. WHERRY

Quadrupole moments of the oxygen and nitrogen molecules. W. H. KEESOM. *Verslag. Akad. Wetenschappen Amsterdam* 29, 718-21 (1921); *Proc. Acad. Sci. Amsterdam* 23, 839-42.—Calcn. of the quadrupole moments of the O and N mols. in K's expression for the second virial coeff. (cf. *C. A.* 10, 990) are developed for the case that the mols. carry a quadruplet.

GEORGE W. MOREY

The compilation of the molecular volumes of the oxides in the periodic system. D. BALAREFF. *J. prakt. Chem.* 102, 283-6 (1921).—Following are the latest data: (I) Li₂O 8.3, Na₂O 13.4, K₂O 17.7, Cu₂O 12.5, Rb₂O 23.5, Ag₂O 15.4, Cs₂O 31.2, Au₂O 16.5; (II) BeO 8.4, Mg₂O 11.8, CaO 16.4, ZnO 14, SrO 22.5, CdO 15.8, BaO 26.7, HgO 19.4, RaO —; (III) B₂O₃ 19.1, Al₂O₃ 12.8, Sc₂O₃ 17.6, Ga₂O₃ 18, Y₂O₃ 22.4, In₂O₃ 19.2, La₂O₃ 25.1, Yb₂O₃ 21.3, Tl₂O₃ 22.3; (IV) CO₂ 28.2, SiO₂ 26.1, TiO₂ 18.0, GeO₂ 22.1, ZrO₂ 22.2, SnO₂ 22.5, CeO₂ 25.5, PbO₂ 25.4, ThO₂ 26; (V) N₂O₃ 32.9, P₂O₅ 29.5, V₂O₅ 25.6, As₂O₃ 26.8, Nb₂O₅ 23.1, Sb₂O₃ 28.6, Ta₂O₅ 30.1, Bi₂O₃ 48.6; (VI) SO₃ 41, Cr₂O₃ 35.4, MoO₃ 32, TiO₃ 34.5, WO₃ 36.6, UO₃ 56; (VII) Cl₂O₇ 85, Mn₂O₇ 46.2. G. L. C.

The valence theory of G. N. Lewis and the asymmetry of the water molecule. EUSTACE J. CUY. *Univ. Calif. Z. Elektrochem.* 27, 371-3 (1921).—Formulas have been developed for H₂O, H₂S and NH₃ on the basis of Lewis' conception of the static atom. These formulas express the abnormal properties of the compds. Discussing the structure of H₂O it is concluded that (1) the angle in the O atom is of about the same value as that between C atoms, corresponding to Vorländer's assumption (*C. A.* 15, 1429); (2) the distance between the O-nucleus and the H-nuclei is one and the same, but differs from the distance of the 2 H-nuclei from one another, the 3 nuclei forming an isosceles and not an equilateral triangle; (3) the pronounced dipolar character of H₂O is due to the 2 H atoms lying in $\frac{1}{2}$ of the tetrahedron and 2 electron pairs in the other half; (4) the asymmetric (biaxial) nature of the H₂O mol. is in agreement with its mol. heat of $6R/2$, whereas for a symmetric structure a mol. heat of $5R/2$ would be expected. It is further pointed out that the asymmetric structure of the H₂O mol. favors association much more than a symmetric structure. H. JERMAIN CREIGHTON

The question of the liquefaction of carbon. SIEGMAR MÜNCH. *Wolfen. Z. Elektrochem.* 27, 367-8 (1921).—It has been found that graphite becomes plastic before reaching its m. p. With sufficiently high amperage small graphite rods can be melted through and welded together again. A description is given of an app. for melting large quantities of C. H. JERMAIN CREIGHTON

The electromotive behavior of aluminium. II. A. SMITS AND G. J. DE GRUYTER. *Proc. Acad. Sci. Amsterdam* 23, 966-8 (1921); *Verslag. Akad. Wetenschappen* 29, 747-9; cf. *C. A.* 14, 3351.—The *T-X* diagram of the system Hg-Al was detd. and the results are given in a diagram only. The curve rises steeply from the m. p. of Hg, reaching 500° at less than 20 mol. % Al, and shows a small amt. of solid soln. on the Al side. Exptl. results of the e. m. f. measurements are not given, but it is stated that, although it would be expected that the potential of Al in an Al salt soln. would become less negative on addition of a little Hg salt, from the fact that the coexisting electrolyte is always relatively richer in Al than the mixed crystal, the reverse is actually the case. From this it is concluded that Hg dissolved in Al is a catalyst for the internal conversions of the Al. GEORGE W. MOREY

Electromotive behavior of magnesium. A. SMITS AND R. PH. BECK. *Proc. Acad. Sci. Amsterdam* 23, 975-6 (1921); *Verslag. Akad. Wetenschappen* 29, 819-20.—The m. p. diagram of the system Hg-Mg was detd. and the results are given in a curve only. The correction to be applied for Hg in the vapor phase was found to be very small up to 50% Hg; beyond this it has not yet been detd. The diagram shows a compd. MgHg₃, having an incongruent m. p. at about 170° and 20 mol % Mg; a compd. HgMg, having a congruent m. p. at 630°; a compd. Mg₂Hg, having a congruent m. p. at

560°; a *compd.* Mg_2Hg , having a congruent m. p. at 575°; a *compd.* Mg_3Hg , (?), having an incongruent m. p. at 510° and 75 mol % Mg; and a *compd.* Mg_3Hg , having an incongruent m. p. at 495° and 77 mol % Mg. The 1:1-3:2 eutectic is at 59% Mg and 556°; the 3:2-2:1 eutectic at 64% Mg and 555°; the 3:1-Mg eutectic at 83% Mg and 449°. The above numerical data are approx., having been read from the authors' curve.

GEORGE W. MOREY

The cymoscopic detector properties of galena. PAULE COLLET. *Ann. phys.* 15, 265-361 (1921).—An exceedingly complete study is made of the whole subject of Hertzian wave detectors or conductors which do not obey Ohm's law (coherers or cymoscopes of wireless telegraphy), but with special reference to sensitized specimens of galena. The characteristics of crystals of this mineral in direct currents, and rectification by them in alternating or interrupted currents have been studied. A fundamental property of galena is found to be that rectification under the optimum conditions occurs if the energy of the current remains small and if the potential drop in the detector measured in open circuit does not surpass a certain limit. With strong energies weak rectification takes place in the inverse sense to that produced with weak energies. Thus there is evidence of 2 modes of rectification in the crystal. Galena is not suitable therefore for use in receiving circuits where it is proposed to measure the energy of the received waves. A study of the vibratory phenomena accompanying the passage of a. cs. of low and high frequencies has led to an interesting reproduction of the voice by galena in radiotelephony expts. To account for all these facts and the modification of sensitivity an hypothesis is constructed, after it is shown that prior theories of detector action such as electrolytic polarization, thermoelectricity, and the purely electronic conception, are inadequate. This hypothesis bespeaks the existence of electropositive elements in the superficial layer of sensitive galena. These corpuscles, the presence of which is connected with that of the S atoms, can explain the unipolar conductivity of sensitized crystals, the conditions of their efficient action as detectors, and the other phenomena of sensitization.

G. L. CLARK

Metastability of the metal world as a consequence of allotropy and its significance for chemistry, physics and technics. VI. ERNST COHEN AND A. L. TH. MOESVELD. Utrecht. *Verslagen Akad. Wetenschappen Amsterdam* 28, 782-6 (1920); cf. *C. A.* 14, 2434, 2435.—It is emphasized that many of the transformations in metals take place but slowly, and that to accelerate these changes to such an extent that they can be detected it is necessary to deal with fine powders, in contact with a soln. of an electrolyte with which the metal is in equil. Consequently Burgess and Kellberg's expts. (*C. A.* 10, 710) are not conclusive; they could not have detected the Sn inversion by their method. Also, Bridgman's failure (*C. A.* 11, 748) to find polymorphic forms in the case of Cd, Pb, Cu, Zn, and Bi is to be ascribed to his use of compact masses of the metals. Rosenhain's objections (discussion of *C. A.* 11, 2290) that the agreement in the value of the electrochem. equiv. of Ag found by different observers negatives the hypothesis that Ag is a mixt. of different unstable forms is without foundation, since the equiv. is a question of mass only, independent of the polymorphic form taken on by the ion after losing its charge.

GEORGE W. MOREY

Chemico-crystallographic notes. H. STEINMETZ. Munich. *Z. Krist.* 56, 157-66 (1921).—New observations are given to fill gaps in previous knowledge concerning substances of special interest in studies of relation of chem. constitution to cryst. form. *Alanine*.—Thin prismatic crystals from H₂O show cleavage on (100) and (1.0). *NH₄ molybdate* (ordinary).—The crystals have lamellar structure, but are not twinned, the optical phenomena being normal. *Benzidine*.—The data indicate this to be monoclinic, not triclinic as has been stated. *Cumarine*.—By slow evapn. of alcoholic solns. crystals showing marked hemimorphism can be obtained; they show

cleavage on (001). *Acetic acid*.—The properties of the cryst. flakes obtained by cooingil an aqueous soln. indicate the crystn. to be rhombic. *Glycollic acid*.—This is found to be monoclinic prismatic with $a:b:c=0.8473:1:0.7885$ and $\beta=114^\circ 57'$; incomplete cleavage on (010). *Hematoxylin*.—The monoclinic sphenoidal symmetry is confirmed. *Lupinine nitrate*.—Etching expts. indicate the symmetry to be bi-pyramidal; moreover the symmetry is only approximately tetragonal. $Na_2PO_4 \cdot 12H_2O$.—Found to be trigonal rhombohedral with $a:c=1:0.5324$. The crystals sepg. from H_2O soln. containing excess $NaOH$ are prisms with terminal base or rhombohedron. There is distinct prismatic cleavage. Etching figs. on the prisms show lack of symmetry planes. $Na_2HPO_4 \cdot 12H_2O$.—By the action of CO_2 on the solns. of the preceding salt crystals of this salt, tabular on the base, were obtained. They show normal angles for the compd., but several forms with large indices. *Strychnine nitrate*.—Found to be monoclinic sphenoidal, with $a:b:c=1.904:1:0.888$ and $\beta=90^\circ 33'$. The crystals are prismatic and rich in forms. There is good cleavage // (100) distinct on (001). Asymmetric etch-figs. are readily obtained. *Rochelle salt*.—Shows incomplete cleavage on (100), very poor on (001). $ZnCl_2 \cdot 2KCl$.—Shows cleavage on (010). Partial optical data are given for several of these compds., [but no detns. of n . Abstractor].

E. T. WHERRY

Catalysis. XII. Some induced reactions and their mechanism. N. R. RATAN DHAR. *Proc. Acad. Sci. Amsterdam* 23, 1074–9 (1921); *Verslag. Akad. Wetenschappen* 29, 1023–8; cf. *C. A.* 15, 2028–9.—A number of cases are enumerated in which the presence of an easily oxidizable substance promotes the oxidation of a difficultly oxidizable substance, e. g., in the presence of Na_2SO_3 , Na_3AsO_3 is readily oxidized in the air. In all these cases the velocity of the oxidation of the rapid reaction is much reduced, the 2nd substance acting as a negative catalyst. Since in the oxidation of sulfites the sulfite ion is the active agent, decrease in its concn. will decrease the velocity of the oxidation. In the case instanced, addition of an arsenite probably results in the formation of a complex ion which is oxidized as a whole, and at the same time decreases the concn. of sulfite ions.

GEORGE W. MOREY

Relations of the van der Waal's constants. W. HERZ. Univ. Breslau. *Z. Elektrochem.* 27, 373–5 (1921).—It is shown that van der Waal's consts., a and b , can be calcd. approx., in the case of non-associated org. liquids, from the number of atoms or the number of valences or from individual crit. data such as b , p , etc. From a and b the coeff. of expansion can be evaluated.

H. JERMAIN CREIGHTON

General methods for the determination of the true molecular constitution of pure substances and their mixtures. MARIO BASTO WAGNER. Lisbon. *Z. physik. Chem.* 98, 81–93 (1921).—A theoretical and mathematical paper in which W. applies his previously developed theory (cf. *C. A.* 14, 2440, 2880) of the thermodynamics of mixts. The paper is not adapted to abstracting.

H. JERMAIN CREIGHTON

Validity of the law of partition for the equilibrium between a mixed crystal phase and a coexisting liquid. I. A. SMITS. Amsterdam. *Proc. Acad. Sci. Amsterdam* 23, 679–86 (1921); *Verslag. Akad. Wetenschappen Amsterdam* 29, 319–26 (1921).—Nernst's distribution law was tested for the equil. between soln. and a mixed crystal phase, the case chosen being the system dichlorobenzene–dibromobenzene–alcohol. On the dibromobenzene side the ratio between the concn. of dichlorobenzene in the liquid and in the solid soln. was found to be sensibly const. up to a concn. in the liquid of 0.231 g. mol. per l., in the solid to 1.947 g. mol. per l. On the dichlorobenzene side the results show a decided trend in the range studied, up to a concn. in the liquid of dibromobenzene of 0.04, in the solid of 0.72 g. mol. per l.

GEORGE W. MOREY

Laws of corresponding states in fused salts. R. LORENZ AND W. HERZ. *Z. anorg. allgem. Chem.* 117, 103–10 (1921); cf. *C. A.* 10, 1612.—Calcn. based upon the data of Jaeger (*C. A.* 11, 414) are presented to establish the validity of the laws for fused

salts. The second "Jaeger sublimation pt." (T_2) must be very close to the b. p. Denoting the m. p. by T_e , $T_e/T_2=0.74$ as the mean in 11 salts (0.65-0.81); calcd., 0.68. According to the theory, the ratio of the densities at b. p. and m. p., d_e/d_e , should be 0.855; mean of 9 salts (0.80-0.88) is 0.855. Of 25 other salts for which J. did not det. T_2 , the b. p. (T_2) was calcd. by $T_2=T_e \cdot 0.68$, and then by J.'s density formulas, d_e/d_e ; mean, 0.864 (0.81-0.92). The critical temp. (T_k), critical density (d_k) and density at abs. zero (d_0) are calcd. by L.'s formulas, $T_k=2.273 T_e$; $d_e/d_0=0.826$; $d_e/d_k=3.120$, for the 34 salts studied by J. The coeff. of expansion (α) calcd. from J.'s density formulas is used to calc. T_k by $\alpha=1/(2T_k-T)$ and the values found to be in satisfactory agreement with those calcd. by L.'s formula.

A. R. MIDDLETON

Existence of hydrates in aqueous solutions. A. SMITS, L. v. D. LANDE AND P. BOUMAN. *Proc. Acad. Sci. Amsterdam* **23**, 969-74 (1921); *Verslag. Akad. Wetenschappen* **29**, 813-8.—Detns. of viscosity-compn. curves of aq. solns. at const. temp. were made with a view to obtaining evidence as to the existence of hydrates. A viscosity-compn. curve was detd. in the system $\text{H}_2\text{O}-\text{FeCl}_3$ at 40°, this temp. being chosen because it is but little above the congruent m. p. of the compds. $\text{FeCl}_3 \cdot 12\text{H}_2\text{O}$ and $\text{FeCl}_3 \cdot 7\text{H}_2\text{O}$, at 37° and 32.5°, resp. The results showed a steady increase in viscosity with increase of FeCl_3 compn. up to almost the compn. of $\text{FeCl}_3 \cdot 12\text{H}_2\text{O}$, then sharp decrease to a minimum slightly below the compn. of the 12-7 hydrate eutectic, followed by a rapid increase in viscosity. This is interpreted as showing the existence of both hydrates in soln. Isotherms were detd. in the system $\text{H}_2\text{O}-\text{SO}_3$, from 61 to 83% SO_3 , covering the range of stable coexistence of the hydrates $\text{H}_2\text{SO}_4 \cdot \text{H}_2\text{O}$ and H_2SO_4 . That at 15° rose to a strongly marked max. slightly beyond the compn. of $\text{H}_2\text{SO}_4 \cdot \text{H}_2\text{O}$ (m. p. 8.53°), then fell to a min. at about the compn. of the eutectic. Isotherms at 40° and at 60° still showed the max., but in a diminishing degree.

GEORGE W. MOREY

The statistical theory of suspensions and colutions. OSKAR KLEIN. *Arkiv Mat. Astron. Fysik* **16**, No. 5, 51 pp. (1921).—A highly mathematical paper divided into a general introduction and 5 sections. The first section sets forth preliminary considerations concerning the suspensions under investigation, including certain postulates, conditions, and definitions. In the second section, applying statistical mechanical methods, a general equation for the probability of arrangement or distribution of a suspension is derived, wherein a method is employed similar to that used by Einstein for the derivation of the differential equation for the diffusion of a suspension. (*Ann. Physik.* **17**, 556 (1905).) In the third section this equation is elucidated by the consideration of a special case, previously considered by Smoluchowski (*C. A.* **10**, 2820). Here it is shown how any original arbitrary distribution or arrangement of the positions and velocity components of the particles gradually changes to that which corresponds to the equil. condition for that temp. In the fourth section the general equation is considered more closely and, by a method of approximation, an equation is derived which is a general form of a differential equation derived by Smoluchowski (see above) for the Brownian movement under the influence of external forces. In the last section a difficulty is pointed out in applying this equation to the problem of the cond. of electrolytes and the possibility of avoiding this difficulty is discussed. Finally, on the assumption that the potential energy is a homogeneous function of the coördinates, a general property of the integral of this equation is deduced which is of interest for the theory of electrolytes.

A. E. STEARN

Double decompositions in heterogeneous systems. The systems: $\text{K}_2\text{CO}_3 \mid \text{BaSO}_4 - \text{K}_2\text{SO}_4 \mid \text{BaCO}_3$; $\text{K}_2\text{CO}_3 \mid \text{CaCO}_3 - \text{K}_2\text{CrO}_4 \mid \text{CaCO}_3$; and $\text{K}_2\text{CrO}_4 \mid \text{AgIO}_3 - \text{KIO}_3 \mid \text{Ag}_2\text{CrO}_4$. E. RAMANN AND H. SALLINGER. Munich. *Z. physik. Chem.* **98**, 103-50 (1921).—It has been found that on the addition of BaCl_2 soln. to aq. mixts. contg. an excess of K_2CO_3 and K_2SO_4 the Ba is distributed primarily between the 2 anions in the ratio of

their concns., $[CO_3^{2-}] : [SO_4^{2-}]$. On the addition of $AgNO_3$ soln. to aq. mixts. contg. an excess of KIO_3 and K_2CrO_4 , the initial distributions of the Ag is likewise in the ratio of the anion concns., $[IO_3^-] : [CrO_4^{2-}] / 2$. The ptn. equil. $BaSO_4$, $BaCO_3$ and $AgIO_3$, $Ag_2CrO_4/2$ differ markedly with respect to their stability. While the former can be fixed approx. by the prompt addition of a large quantity of alc., the latter does not require any special treatment. In the system $xK_2CO_3 + yK_2CrO_4 + zCaCl_2$, ($x > z + y$) it is not possible to retain the equil. by the addition of alc. In general the ptn. equil. is labile, in so far as reactions occur in the system which alter the salt proportion in the solid phase (soln. equil.). The soln. equil. has been detd. in the system $K_2CO_3 | BaSO_4 - K_2SO_4 | BaCO_3$ for different concns. of total K salt, in the system $K_2CO_3 | CaCO_3 - K_2CrO_4 | CaCO_3$ for different concns. of total K salt and at several temps. between 25 and 96°, and in the system $K_2CrO_4 | AgIO_3 - KIO_3 | Ag_2CrO_4$ for a total salt concn. only and at only 20°. For the system $K_2CO_3 | BaSO_4 - K_2SO_4 | BaCO$ it has been found that the distribution ratio $K_2CO_3 | K_2SO_4$ depends markedly on the total concn. of K salt. No measurements have been made of the dependence of this ratio on temp. On the other hand, in the system $K_2CO_3 | CaCO_3 - K_2CrO_4 | CaCO_3$, the distribution ratio $K_2CO_3 | K_2CrO_4$ is markedly influenced by temp. and but slightly by the total salt concn. This ratio is a linear function of the temp. The concluding portion of the paper is devoted to a theoretical treatment and discussion. H. JERMAIN CREIGHTON

The problem of the constitution of fossil organic matter and the relation of its solubility in organic solvents at atmospheric pressure and excess pressure to its natural mode of formation. C. ENGLER AND J. TAUSZ. *Z. angew. Chem.* 34, Aufsatzeil, 308-9 (1921).—An attempt to explain the increase in solv. of bitumens and certain gums (amber, copal, dammar, pyropisite) in C_6H_6 as the pressure and temp. increase (*C. A.* 11, 1738). *Shale oils* with approx. 10% bitumen were examd. Three parallel expts. were made: (1) extn. with C_6H_6 at 80° only, (2) heating dry at 270°, then extn. with C_6H_6 at 80° and (3) heating in autoclave at 270° with C_6H_6 , then extn. at 80°. The exts. from (2) and (3) were approx. the same, each about 15% more than (1). Heat is evidently the agent in increasing solv. because of partial depolymerization (*Ber.* 35, 4150 (1902)). This action is correlated with the probable formation in nature of waxes, fats and resins through depolymerizatoin. These in turn hydrolyze to form the fauna and flora found in certain muds, clays and sediments. If the process is incomplete, there is formed ozocerite, adipocere and pyropisite. C. C. DAVIS

Composition of the gaseous phase of mixtures of alcohol and ether as a function of the liquid phase. L. J. OLMER. *Bull. soc. chim.* 29, 385-89 (1921).—The alc. used was 95%, as the object of this work was to duplicate industrial conditions. The method consisted in introducing the liquid mixt. into a vacuum and bringing it to the detd. temp. When equil. was reached the gaseous mixt., now no longer in contact with the liquid phase, was caused to pass through tared absorption tubes, one of soda-lime and potash for the alc. and the other of pumice satd. with H_2SO_4 for the ether. Detns. were made for temp. range from -20° to +30°, and for mixts. contg. 5, 10, 20, 50, and 75% ether. Curves were then plotted carrying the vapor pressures of these mixts. as previously detd. as ordinates, and the % of ether in either the gaseous or liquid phase as abscissas. These curves, plotted on a large scale, have facilitated the study of the drying of powder B. A sample of the atm. over the drying tray is taken, the temp. noted, and the vapor pressure of the alc.-ether mixt. in the sample is detd. by absorption of both in H_2SO_4 or cresols. The curves will then give the compn. of the gaseous phase as well as that of the liquid remaining in the powder. J. T. R. ANDREWS

Vapor pressures of mixtures of 95% alcohol and ether. L. J. OLMER. *Bull. soc. chim.* 29, 382-85 (1921).—The method employed is that known as static, in which the mixt. of alc. and ether is introduced into a vacuum, the whole is brought to the de-

sired temp. and the pressure read from a barometer. Pressure-temp. curves are plotted for 95% alc., for pure ether, and for mixts. contg. 10, 20, 40, 60, and 80% ether in alc., from -20° to $+20^{\circ}$. The results are well represented by the empirical formula: $P = a + (b - a)x^n$, in which P is the vapor pressure of the mixt., a and b are the vapor pressures of alc. and ether resp. at temp. under consideration, x is the % of ether in the mixt., and n is a const. equal to 0.7. This formula is convenient, though no theoretical significance can be attached to it.

J. T. R. ANDREWS

The occlusion of water by gas-mask charcoal. BEN E. BROWN. *Phys. Rev.* 17, 700-06 (1921).—The variation of the amt. of water in charcoal with change in temp. is detd. for ranges of temp. between 102° and 140° at a pressure of 74 cm. of Hg. About $\frac{1}{3}$ of the water came off at 112° to 114° . The variation of pressure with 3 of the 4 concns., over the range of temp. from 95° to 130° , was such as to correspond fairly closely to the variation of pressure for solns. It is very noticeable that charcoal and water follow Raoult's law for solns., *i. e.*, the vapor pressure of an ideal soln. of fixed concn. divided by the satd. vapor pressure of the solvent at the same temp. is a const. for all temps. This would indicate that the mol. forces exerted by charcoal on adsorbed substances are similar to the forces between the mols. of a solvent and dissolved substance.

J. T. R. ANDREWS

Adsorption of odorous molecules on the surface of solids. H. ZWAARDEMAKER. *Proc. Acad. Sci. Amsterdam* 23, 654-7 (1921).—Adsorption of odorous material on solids may take place in 3 ways: (1) through the condensed layer of air and H_2O usually present on all surfaces; (2) by direct adsorption to surfaces from which this condensed layer has been removed; (3) direct attraction of particles of opposite sign by an electrically charged surface. The first type is the usual one, but in it the lower layer has a perceptible effect, as the odor in some cases persists after the condensed layer has been removed. Cases of the first type are the following. Pyridine was hardly adsorbed by glass, while valerianic acid was strongly adsorbed; a similar contrast was observed with pyridine and skatole on Al, and isoamyl acetate and skatole on iron and tin; on porcelain the skatole is hardly adsorbed, while isoamyl acetate is more strongly adsorbed than any other substance. Adsorption of the second type was demonstrated with amber, S and paraffin. Many remarkable instances occur in which one adsorption cancels another, *e. g.*, eugenol or xylidine will drive out allyl alc., but the reverse action does not take place.

GEORGE W. MOREY

Spray electricity of solutions of electrolytes. H. ZWAARDEMAKER AND H. ZEEHUISEN. *Proc. Acad. Sci. Amsterdam* 23, 658-62 (1921).—Odorous substances give a positive charge to the spray, pure H_2O and most inorg. salts give no charge, but a few salts impart a slight negative charge. This is probably to be ascribed to the anions being in excess on the surface of the drops.

GEORGE W. MOREY

Thermodynamics of normal elements. XII. ERNST COHEN, A. L. TH. MOESVELDT AND C. I. KRUISHEER. *Verslag. Akad. Wetenschappen Amsterdam* 28, 1085-99 (1920).—The calcns. of von Steinwehr (*C. A.* 14 1772) are repeated, better data being used. The calcn. of the chem. energy of the Weston cell, and the comparison of this value with that calcd. from the temp. formula of the Weston cell, gives results indentical with those previously published (*C. A.* 15, 792). The temp. coeff. of the chem. energy at 18° is equal to the algebraic sum of (a) the temp. coeff. of the heat of reaction of the process $Cd + Hg\cdot SO_4 + \frac{1}{2}H_2O = 2Hg + CdSO_4 + \frac{1}{2}H_2O$ calcd. to be +21.16 g. cal. per degree; (b) the temp. coeff. of the differential heat of diln. per $\frac{1}{2}H_2O$, +2.509 g. cal. per degree; and (c) the temp. coeff. of the theoretical heat of soln. of $(8/3)/[15.17 - (8/3)]CdSO_4 \cdot \frac{1}{2}H_2O$, -4.57 g. cal. per degree, the quantities under (b) and (c) to be taken negatively. The total temp. coeff. of the chem. energy at 18° thus becomes +23.22 g. cal. per degree, while the temp. formula of Jaeger and Wachsmuth gives 17.44 and that of Wolff, 27.10. It

is pointed out that the temp. formula of J. and W. gives a minimum of solv. of $\text{CdSO}_4 \cdot \frac{1}{2}\text{H}_2\text{O}$ at -9° , in agreement with the exptl. detn. of Cohen and Wolters (*C. A.* 12, 2478), while the formula of Wolff gives $+3^\circ$. GEORGE W. MOREY

Thermal expansion of molten salts. W. HERRZ. Univ. Breslau. *Z. physik. Chem.* 98, 98–102 (1921).—Measurements have been made at several temps. of the d. of the following molten salts: Na_2MoO_4 , LiNO_3 , NaNO_3 , RbBr , CsNO_3 , K_2WO_4 , CsI , K_2MoO_4 , Na_2WO_4 , RbF , Cs_2SO_4 and TiNO_3 . The results obtained show that Mendelyéev's equations for the thermal expansion of liquids, which hitherto has only been proved for "ordinary liquids," also holds for molten salts. H. JERMAIN CREIGHTON

High temperature studies. XIII. The measurement of vapor pressures at high temperatures and the vapor pressures of alkali halides. O. RUFF AND SUSANNE MUGDAN. *Z. anorg. allgem. Chem.* 117, 147–71 (1921); cf. *C. A.* 13, 3054.—By measuring the loss in wt. of the substance held at temps. first slightly above that at which the phenomena of boiling are first noticed, and then at somewhat higher temps. and for different pressures, it is possible to det. the vapor pressure of solids at high temps. The temp. may be reached in a Heraeus furnace with Ni-wound tubes for temps. up to 1200° and in a C resistor furnace for high temps. Temp. is measured with an optical pyrometer for which calibration data are given. During the course of a detn. N is passed through the system at such a rate as to keep its pressure practically const. The container or boiling flask depends on the substance under examn.; for metals, which have a relatively high surface tension, it may be of porous C or graphite; for salts, which have a lower surface tension, optically opaque quartz (opaque at the temp. used) is better. For metals these containers should not have a capacity greater than 0.2 cc. while for salts 0.6–0.7 cc. is necessary. The method was checked up using previously obtained data on the vapor pressures of As, Sb, Bi, and Cu, all of which data are included in the article. Using this method then, the vapor pressures of the alkali halides were detd. The data cover from 7 to 9 points on the curve and the vapor pressure range is from 40 to 60 mm. up to the b. p. The following table gives the b. ps. obtained by calcn. or extrapolation from vapor pressure data given in the original. Temp. is given in degrees C.

LiCl	1337	NaCl	1442	KCl	1415	RbCl	1388	CsCl	1289
LiBr	1265	NaBr	1396	KBr	1388	RbBr	1340	CsBr	1297
LiI	1189	NaI	1299	KI	1319	RbI	1304	CsI	1280

The heats of vaporization of these salts are calcd. according to the equation: $\lambda = -1.985 \times 2.303 \times [\log p/d(1/T)]$ and are as follows. They are given in calories.

LiCl	36870	NaCl	46650	KCl	43130	RbCl	46580	CsCl	39750
LiBr	35710	NaBr	40100	KBr	40820	RbBr	39970	CsBr	36870
LiI	35170	NaI	39410	KI	38100	RbI	36870	CsI	44320

The crit. temps. (T_K) are calcd. to be as follows:

LiCl	2495	NaCl	2658	KCl	2614	RbCl	2575	CsCl	2421
LiBr	2384	NaBr	2587	KBr	2575	RbBr	2500	CsBr	2433
LiI	2266	NaI	2435	KI	2468	RbI	2444	CsI	2407

Finally, a comparison is made between the observed values and those calcd. by the Ramsay-Young rule; the latter is shown not to hold exactly. E. H. D.

Researches with a flame of exceptionally high temperature. E. HAUSER AND E. RIE. *Sitz. Akad. Wiss., Wien, Abt. IIa* 129, 539–47 (1920).—A flame and burner are described by which it was found possible to reach a temp. of at least 3000° , the highest ever attained without the use of elec. energy. A liquid inflammable hydrocarbon is dispersed from the burner into a horizontal cone by H_2 gas. This cone is surrounded

by an outer mantle of O_2 issuing from the outer part of the burner. The resultant flame is about 1 meter long, is luminous from incandescent colloidal C, and gives a continuous spectrum. If a rod of C is placed in the flame a layer of crystal graphite forms where the central hottest part of the flame has been in contact. If a porcelain plate is held in the flame a layer of soot or amorphous C is first deposited, but this is transformed to graphite when heated for a longer time in the hottest portion of the flame. This graphite possesses an unusual appearance. It consists of thin sharp platelets with a distinctly metallic cast on the side next to the porcelain, together with some small, transparent, strongly refracting crystals. On the other side the deposition is in fairly regular hexagonal figures similar in appearance to those resulting from the pptn. of colloidal graphite. Soot from camphor and wood charcoal both produce similar graphite in this flame. SiC and carborundum are easily formed, and Zr, W, Mo and Cr melted. Excellent photomicrographs are given. The graphite was identified through its conversion to yellow graphitic oxide by the method of Staudenmaier (*Ber.* 31, 1481(1898); 32, 1394 and 2824(1899)).

G. L. CLARK

A thermoelectrical differential method for the determination of transition points of metals at comparatively low temperatures. A. SMITS AND J. SPUYMAN. *Proc. Acad. Sci. Amsterdam* 23, 977-9(1921); *Verslag. Akad. Wetenschappen* 29, 821-3.—In order to obtain evidence as to the existence of a transition point in Cu at 70°, the e. m. f. of a Ag-Cu couple was studied. The cold junctions were kept at 0°; the hot junction was placed in a tube of $CuSO_4$ soln. immersed in a thermostat. No break was observed. A differential method, in which one Cu-Ag junction was in $CuSO_4$ soln., the opposed Ag-Cu junction in paraffin was then tried, with similar negative results.

GEORGE W. MOREY

Thermoelectric determination of transition points. I. A. SMITS AND J. SPUYMAN. *Proc. Acad. Sci. Amsterdam* 23, 687-96(1921); *Verslag. Akad. Sci. Amsterdam* 29, 327-40.—The transition point of tetragonal tin into rhombic tin was detd. from the e. m. f.-temp. curve of the couples Sn-Fe and Sn-Cu as 200.2°. GEORGE W. MOREY

Photoelasticity for engineers. V. The stress-strain properties of nitrocellulose and the law of its optical behavior. E. G. COKER. *Gen. Elec. Rev.* 24, 455-66(1921); cf. *C. A.* 15, 1048.—The principle matters examd. were the mechanical properties of celluloid under pure tensile and bending stress and the laws of its optical behavior thereby. In tests on specimen bars, 1 inch wide, cut from celluloid plate $\frac{3}{16}$ inch thick, a length of 6 inches, was used for longitudinal strains. (Under moderate loads the polariscope showed the stress uniformly distributed for a length of $6\frac{1}{2}$ inches.) Stress-strain curves from 20 lbs. up were approx. linear; E (Young's modulus) was found to be 355,000; the elastic limit is not pronounced, but could be taken as 1900 lbs./in.² (for the celluloid used); the behavior under loads beyond the elastic limit resembles that of a mild steel overstrained and allowed to rest. The value of E appears higher for the surface layer than the interior, especially on aging. The optical investigation was principally directed to checking the law of optical retardation, usually assumed to be a linear function of the stress difference. Two methods were employed. In the first, a standard celluloid beam under pure bending stress, directly calculable, was used for comparison with the photoelastic effect of the piece under tension, the stress in the comparison beam being adjusted to balance the retardation in the piece under tension, both being in the polarizing train. The results showed that the law of retardation is linear for stress to twice the range of the elastic limit, where it is impossible for the strain to be linear. This result was confirmed by spectro-polarimetric examn.; the relative retardation of phase due to a narrow section of a beam of celluloid under pure bending moment produced black bands in the spectrum whose distance apart depends on the law of retardation. The data obtained confirmed the result that a linear optical function

for stress holds to twice the elastic limit, and within this range optical detns. of stress are reliable.

S. E. SHEPPARD

The conduction of electricity and diffusion in solid salts. G. HEVESY. *Sitz. Akad. Wiss., Wien, Abt. IIa* 129, 549-64 (1920).—The conduction of electricity in salt crystals is explained as being due to the fact that the single ions vibrate in elongated paths and in this condition may be displaced to another part of the crystal lattice. It follows that without an elec. field there might be expected a self-diffusion of the ions in crystals, which could be calcd. from the conductivity. For rock-salt at room temp. the conductivity is 10^{-17} ohm $^{-1}$, a value 4×10^{17} times smaller than for molten NaCl at 850°. Both solid and melt are considered to be completely ionized so that the ionic mobilities in the 2 states of aggregation are in the same ratio as the conductivities. Assuming further that Na and Cl ions move with essentially the same ease, then the diffusibility and the mobility are parallel, and the former therefore also in the same ratio as the conductivities, *viz.*, $\frac{1}{4} \times 10^{-17}$. The diffusion const. of the Na ion in the molten salt is calcd. from the conductivity as 1.3 cm. 2 per day, from which the self-diffusion const. of NaCl at room temp. is found to have the extremely small value of 3×10^{-18} cm. 2 per day. Thus it would require 3×10^{14} yrs. for 1% of the ions in a 1 cc. cube attached to 3 other like cubes of NaCl to diffuse into the farthest cube. With increasing temp. the const. rises rapidly. For NaCl slightly below the m. p. the const. is 0.014, and for PbCl₃ 80° below its m. p. 0.027 cm. 2 per day. In the case of the latter salt the diffusion const. may be exptly. detd. by measuring the diffusion of radioactive isotopic PbCl₃ into inactive PbCl₃ by means of the electroscope. This gave 0.029 cm. 2 , in good agreement with the above.

G. L. CLARK

Influence of the electrode potential on the sparking potential of gases. G. HOLST AND E. OOSTERHUIS. *Verslag. Akad. Wetenschappen Amsterdam* 2, 849-50 (1921).—Expts. with Ne, using various electrode materials, showed that, contrary to the usual statement, the nature of the electrode material materially affected the sparking potential.

GEORGE W. MOREY

"The behavior of non-attackable electrode in the equilibrium process $3\text{HNO}_2 \rightleftharpoons 2\text{NO} + \text{HNO}_3 + \text{H}_2\text{O}$." H. PICK. Berlin-Dahlem. *Z. Elektrochem.* 27, 369-71 (1921).—Polemical against Klemenc (*C. A.* 15, 1648). P. points out that the potential relations derived by K. are incorrect.

H. JERMAIN CREIGHTON

Conversion of radiant energy into light energy. ALFRED R. MEYER. *Z. Beleuchtungsw.* 1921, 35-40, 43-6; cf. *Elektrotech. Z.* 37, 142, 157, 667.—The investigations of Ives, Nutting, Lummer, *et al.*, are critically reviewed and conclusions drawn. A series of highly instructive curves is included showing the relation between total energy and light energy, relation to temp., etc. The sp. energy consumption, in watts per hefner candle, of the more modern sources of illumination are given as follows: Incandescent (water) gas mantle 10; C₂H₂ gas mantle 5; incandescent C filament 3.9; Nernst (rare earths) glower 2.4; incandescent W filament in vacuum 1.35; gas-filled W lamp 0.6; flaming C arc 0.48; Hg arc 0.32.

C. G. F.

The relation between the anomaly of dilatation and the thermal variation of magnetism in ferromagnetic alloys. P. CHEVENARD. *Compt. rend.* 172, 1655-7 (1921).—In a progressive and reversible transformation from one phase, α , which is stable at abs. zero, to a second phase, β , which is stable at ordinary temps., the state of a substance, x , at any temp., θ , may be expressed in terms of the α phase. Then $X = (V - V_\beta) / (V_\alpha - V_\beta)$ where V , V_α , and V_β represent sp. vols. At abs. zero $x = 1$. When $x = \int(\theta)$ is plotted against the anomaly of dilatation it is shown that for alloys of large total anomaly (Fe₂Ni), the amt. of x is sensibly proportional to the square of the magnetism of satn., I^2 , at all temps. below Curie's point. The anomaly is negative when V_α is greater than V_β as in Fe₂Ni, Fe₃C, etc.; it is positive in reverse cases, as with Fe₃O₄.

Ni, and Ni-Co alloys, etc. For certain alloys of low total anomaly when subjected to increasing temp. the difference in dilatability of the 2 phases changes and the sign of the anomaly therefore changes from + to -. W. A. MUDGE

Magnetic susceptibility of nickel and cobalt chloride solutions. LAURA S. BRANT. *Phys. Rev.* 17, 678-99(1921).—The magnetic susceptibilities of NiCl_2 and CoCl_2 solns. were found by a modification of the Kelvin-Wills method. Data are given for NiCl_2 solns. ranging in molar concn. from 0.0010 to 3.765 and for CoCl_2 solns. from 0.001018 to 2.0353, for field ranges from 3,000 to 14,000 gausses for the lower concns. and 3,000 to 10,000 for the higher. All measurements were at 20° . Susceptibilities of the salts were computed from these of the solns. by application of the Wiedemann law, and the susceptibilities of the metals by extending the Wiedemann relations to the salts. Susceptibilities of the solns. measured were found to be independent of the field strength, and those of the salts to be independent of the concns. of solns. used. The value found for the mol. susceptibility of Ni is 0.004423 and of Co 0.010362. Upon application of Weiss's equation these values give 16.0 and 24.5 magnetons, resp., for Ni and Co atoms. An auxiliary result obtained is that the vol. susceptibility of air, at 20° and av. conditions as regards pressure and moisture extending over a number of months, is 0.0288×10^{-6} . Values obtained for Ni are in good agreement with the results found by Cabrera, Moles, and Guzman, and by Weiss and Mle. Bruins; the values for Co agree with those of Trümpler in his second series of measurements. The magneton number found for Ni supports the Weiss magneton theory, while the number for Co presents again the half-magnetron already found in other solns. J. T. R. ANDREWS

Boron and silicon chemistry. Experimental investigation of very volatile material (STOCK) 6. Erroneous biological theory of the Brownian movement (OCARANZA) 11A. Thermal, electrical and magnetic properties of alloys (SMITH) 9.

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3—SUBATOMIC PHENOMENA AND RADIOCHEMISTRY

GERALD L. WENDT

The explanation of the X-ray spectra and the constitution of atoms. L. VEGARD. *Physik. Z.* 22, 271-4(1921).—Controversy with A. Smekal (cf. *C. A.* 14, 2581). L. emphasizes that during the emission all electrons are mutually influenced and not only the one which causes the actual radiation. E. FIERTZ

Excitation of the spectra of argon by slow electrons. GEORGES DÉJARDIN. *Compt. rend.* 172, 1482-4(1921); cf. *C. A.* 15, 3028.—Argon has 3 types of spectra, a red and a blue one, in which the lines of one do not occur in the other. A third, the white spectrum, embracing both of the other spectra. These spectra were studied in a 3-electrode tube filled with A, such as is used by the army wireless telegraph corps, as a function of the accelerating potential applied to the electrons. At about 15 v. the ionization set in. At 16 v. the first lines of the red spectrum began to appear. On increasing the voltage up to 33 v., with 4 amperes in the filament of the tube, a large number of lines appeared, all belonging to the red spectrum. At 34 v. the spectrum changed; a considerable number of blue lines appearing at 35 v. The number of lines increased up to 40 v., above which some lines ascribed by Stark to A atoms that have lost three electrons appeared. No discontinuity was observed in the electron current in passing the value of 34 v., which marks the initial appearance of the blue line spectrum. When the filament current was increased to 5 amperes the blue lines began to appear at 17 v., though in very feeble intensity. If the p. d. was increased to 35 v. there was a sudden marked increase in intensity of the blue lines between 32 and 35 v. These results are in general agreement with the theory of Stark, which ascribes the red lines to positively charged atoms with a single charge and the blue lines to positively charged atoms with two and three charges. The appearance of the blue lines at 17 v., with heavy electron currents, is described as being due to the removal of the second electron by impact of slow moving electrons with less than the energy for removing the second electron, with singly charged atoms that are in a radiating state, (*i. e.*, with atoms that have absorbed enough energy so that the sum of the energy absorbed and the energy of the impinging electron together equal the energy required to remove the second electron).

L. B. LOEB

A constant light source with continuous ultra-violet-light spectrum. G. GEHLOFF. *Z. tech. physik.* 1, 224-7(1920).—Gas-filled W or Ta lamps provided with a quartz window will furnish ultra-violet light down to $220\mu\mu$ so that absorption spectrographs can be taken in a reasonably short time.

F. O. A.

The dielectric constants of phosphorescent substances and the absolute wave lengths of the lasting distribution of the spectral lines. FERDINAND SCHMIDT. *Ann. Physik* 64, 713-32(1920).—This paper is a continuation of the work of Lenard on phosphorescence and confirms the latter's theory. (cf. Lenard, *Ann. Physik* 15, 225 (1904); *C. A.* 4, 1840.) The author's summary: "The positions of the spectral lines of the observed lasting distribution of phosphorescence are not const., but vary with the dielec. const. of the phosphorescent material and with the magnitude of the phosphorescent center. Only the abs. wave lengths, obtained by division of the observed spectral positions by \sqrt{n} (n = dielec. const.), are characteristic for the phosphorescence; they represent the wave lengths of the light rays the metal atoms would send in the free ether. These wave lengths are the same for corresponding lines of metals with altogether different at. numbers. For these abs. lasting distributions of wave lengths the laws for light and high-frequency spectra could be confirmed. The metal atom in the phosphorescent center is, therefore, influenced by light absorption as if being in the free ether, the light oscillations being changed according to well defined laws by the dielec. const. of the phosphorescent material." E. FIERTZ

X-ray examination of materials. J. R. CLARKE. *Beams* 8, 125-32(1921).—A review.

C. G. F.

The direct measurement of the velocity of electrical particles in gases. A. LAFAY. *Compt. rend.* 173, 75-6(1921).—Two plane parallel plates of a condenser very close together form a narrow rectangular tube of small cross section. Through this tube a current of air of uniform velocity is driven. Between the plates there is an elec.

field of several thousand volts per cm. Through a minute hole in the center of one of the plates a narrow stream of ions is introduced by the suction. The lower plate is coated with an insulator except at one place. By varying the field, and the velocity of the air current, the velocity of the ions may be detd. For air currents of from 5 to 40 m./sec. the mobilities of the ions were found to be 1.59 cm./sec. for the + ions and 1.65 cm./sec. for the - ions. If the mobilities of the ions are known the method might be used as a sensitive anemometer for use on airplanes. The ionic mobilities were also detd. by placing the hole by which the ions enter on a disc mounted on an ebonite shaft which could be rotated rapidly. Another disc covered by an insulating coating except for a small sector, was placed on the same shaft and insulated from the first disc. Between the two discs was placed a small parallel plate condenser, with two holes placed opposite each other, whose planes were parallel to the faces of the two discs. By arranging the field so that the ions crossed the condenser while the rotating discs turned through a given angle the mobilities of the ions could be obtained by comparing the velocity in the field with the velocity of revolution of the disc. The mobility at atmospheric pressure was studied with this app. L. was surprised to find that the mobilities of the ions were very sharply defined in a single class. He had expected to find, in view of the notion that the ions were composed of clusters of mols., that there were different groups of ions corresponding to clusters of various sizes. (Abstractor's note:—The results obtained are not surprising. Other workers in this field have shown that the gaseous ions of mobilities of the order of magnitude measured above, are not clusters at all but are merely single charged mols. See Loeb, *C. A.* 11, 416; Yen, *C. A.* 12, 1528, Wellisch, *C. A.* 11, 2978.)

L. B. L.

The potential gradient between the electrodes of vacuum-tubes. H. SCHÜLER. *Physik. Z.* 22, 264-8 (1921).—Whereas the distribution of the potential gradient in ordinary vacuum tubes has not yet been successfully analyzed, S. was able to make a thorough investigation of a specially constructed vacuum-tube, having two co-axial cylinders as electrodes. Simple relations exist between the potential gradient at the cathode ("Kathodenfall") or at the anode ("Anodenfall"), the ionization-tension of the gas and the ratio of the free path of the electrons and the free path of the gas-mols. But contrary to previous expts. it could be shown that for Al electrodes in an atm. of H₂ two distinctly different forms of elec. discharge exist, and the same holds true for Fe electrodes in H₂; the term "normal cathode gradient" loses, therefore, its significance. Under certain conditions the total potential is equal to the cathode gradient, the anode-gradient is, therefore, not a necessary condition of the discharge. The expts. indicate that the potential gradient between the electrodes depends only on the consts. of the gas, the effect of the electrodes seems to be only catalytic. Quant. measurements have been made with H₂ gas, and the original paper should be consulted for these results.

E. F.

Passivity and photoelectricity. WILHELM FRESE. *Z. wiss. Phot.* 21, 37-44 (1921).—Exception is taken to the claim of Allen (*C. A.* 7, 3267) that active Fe is strongly sensitive photoelectrically, whereas passive Fe is weak. The cause of the difference, according to F., lies rather in the occlusion of H which takes place in the process of activation, for H has been shown to be the principle carrier of photoelec. sensitivity. All strong oxidizing agents lower the sensitivity of Fe, Ni, Co, Pt, Pd, Au, Ag, Zn, Cu, and Al, whereas reducing agents increase it.

G. R. FONDA

The circumnuclear functions of Lagrange. MARCEL BRILLOUIN. *Compt. rend.* 173, 30-32 (1921).—Mathematical paper, giving the results of an attempt to find the most general Lagrangian function which will give privileged orbits possessing the essential characteristics of the Bohr-Sommerfeld orbits. The function is presented in its finished form, and it is shown that this function will yield the desired results. L. B. LOEB

The röntgenographic derivation of the symmetry and element of molybdophyllite (AMINOFF) 8. Crystal structure and the construction of the atom (NICOLI) 2. Conversion of radiant energy into light energy (MEYER) 2. The valence theory of G. N. Lewis and the asymmetry of the water molecule (Cuy) 2.

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4—ELECTROCHEMISTRY

COLIN G. FINK

Electric smelting furnaces. F. ROWLINSON. *Beama* 8, 14-22, 140-6(1921).—An illus. review. C. G. F.

The present status of the electric furnace in western states. LLOYD W. CHAPMAN. *J. Elec. Western Ind.* 46, 639-40(1921).—Data have been collected from the larger public service power companies of the 11 western states as to their elec. furnace load. The list includes elec. furnaces for the production of the following: HNO_3 , alloy steel, ferro-alloys, brass and non-ferrous alloys, Zn, ZnO , cast Fe, refractories, and ordinary steel castings. The total connected load is 53,560 kw. and of this more than half is installed at Great Falls, Mont., for the production of Fe-Mn. For steel castings the connected load is about 18,000 kw., leaving 7,000 kw. for all other purposes. The demand rate in vogue in western states has prevented the installation of large size steel furnaces. The av. capacity for the 26 furnaces installed is 700 kw. a. The high price of elec. energy for elec. furnace use in industrial centers is a great factor in preventing the installation of elec. furnaces in these states. The Pacific coast is totally lacking in one necessary industry: the production of Fe from ore. Electricity must play a leading role in building up an iron and steel industry along the coast. LOUIS JORDAN

The Tagliaferri electric furnace. MARIO-MARANTONIO. *J. four élec.* 30, 53-8 (1921).—The Tagliaferri furnace was designed and constructed particularly for the production of high grade high-speed steels. In practice this furnace has proved itself adapted to the production of ordinary and special steel castings, the prepn. of alloys, and the melting of Cu, Al, Ni, brass, and bronze. The characteristic feature of this furnace is the presence of an auxiliary electrode entering through the side wall of the furnace for each main electrode entering vertically through the roof. The arcs may strike either between the main electrodes and the bath or between the main and auxiliary electrodes. The electrodes are so connected that in either case the arcs are in series. The operating voltage is 100 to 130 v.; electrodes of small cross-section are used from which there results a saving in the cost of installation, and a better thermal efficiency. Indirect arc heating (main to auxiliary electrodes) avoids current surges during the melting down period and the 3 arcs (in the 3-phase furnace) give an even distribution of heat. After melting down the arcs are struck between the main electrodes and the bath and by direct arc heating the necessary superheat for refining is obtained. There is complete control of the intensity, the direction and the distribution of the arcs and the energy consumption is so steady that the furnace may be connected directly to 2- or 3-phase low tension supply lines. Furnaces of this type of a capacity up to 30 tons have been constructed. The power consumption per ton of steel varies from 850 kw. hrs. with a cold charge and 300 kw. hrs. with a liquid charge in the 1-ton furnace to 580

kw. hrs. with cold charge and 100 kw. hrs. with liquid charge in the 30-ton furnace. These values are for refining with a single slag. Details of construction and operation of the furnace are given, including illus. of installations and diagrammatic drawings of 1-, 2-, and 3-phase furnaces.

LOUIS JORDON

Electric heating furnaces in steel works. V. GUILLERMAN AND M. GILLOT. *Revue industrie minérale; J. four. Elec.* 30, 38-40(1921).—The furnaces previously considered have the disadvantages that the distribution of heat is not even, the upper part of the charge is superheated, the length of a run is increased, and there results in the product chem. heterogeneity which is not removed by the agitation during pouring. The use of *conducting-hearth furnaces* is a step towards insuring high quality steel. Conducting hearths are of two kinds: (1) the hearth with no resistance and (2) the resistance or heating hearth. Furnaces embodying the second type of conducting hearth have some undeniable advantages. In these furnaces heat is developed in the hearth by its own elec. resistance. This heat supplements the heat developed in the metal charge by reducing the amt. of heat given up by the charge to the hearth. The requirements to be met in constructing such a hearth are: (1) to obtain in the upper layers of the hearth enough elec. resistance and good thermal conductivity; (2) in the lower layers to obtain very low resistance and low thermal cond. From 10 to 15% of the total power used in a furnace may be expended in the hearth. In the construction of this hearth Cu bus bars are placed horizontally at the bottom of the furnace and bedded in a graphite and tar mixt. Above this the hearth is built up of a mixt. of magnesite or dolomite with graphite and soft Fe filings rammed into place with tar. The amt. of graphite and filings in the mixt. decreases as the hearth is built up and becomes *nil* at some distance from the surface. The cond. of the lower portion may be increased by embedding mild steel bars placed vertically with their lower ends in contact with the layer of graphite, their upper ends at a distance below the surface of the hearth depending on the resistance desired in the hearth. Such bottoms may last for 1000 heats on account of the variation in temp. during a heat being less in a furnace with this hearth than in an ordinary furnace; also, the high temp. of the surface of the hearth allows more satisfactory burning in of magnesite or dolomite patches. Conducting-hearth furnaces are operated on 1-, 2-, or 3-phase systems. The Natusius furnace may be considered a conducting-hearth furnace. In the 2- or 3-phase furnaces the magnetic field is in a vertical plane. This causes a stirring of the metal which gives thermal and chem. homogeneity to the melt. Probably the high quality of special steels made in conducting-hearth furnaces is due to the even distribution of heat during the whole operation.

LOUIS JORDON

Portable electric (Baily) furnace used to heat sheet metal. ANON. *Elec. Rev.* (Chicago) 79, 213(1921).—A 100 kw. Baily elec. furnace constructed so as to be handled by a crane is used for heating sheet metal. A remarkably uniform temp. is obtained on the sheets and scaling is reduced to an almost negligible amt.

LOUIS JORDON

Laboratory type of electric furnaces. EZER GRIFFITHS. *Beama* 9, 12-8(1921).—An illus. review. G. broadly classifies elec. lab. furnaces as follows: (1) Wire or ribbon wound tubular furnaces; (2) graphite spiral furnaces; (3) C tube furnaces; (4) W and Ir tube furnaces; (5) zirconia and yttria tube furnaces; granular resistor furnaces; (7) induction furnaces, low and high frequency types; (8) arc furnaces; (9) cathode ray furnaces.

C. G. F.

Choice of electric furnace refractories. ANON. *Elec. World* 78, 260(1921).—Some of the special requirements for refractories for the elec. furnace are m. p. as high as 1700-50°, resistance to sudden temp. changes, constancy of vol., resistance to slags, resistance to corrosion by fumes, and mechanical properties at high temp. giving strength and resistance to abrasion.

LOUIS JORDON

Electrical methods in the fixation of nitrogen. F. ROWLINSON. *Beama* 8, 542-3

(1921).—5 illus. A detailed review. A comparison of the various processes, on the basis of power consumed in the production of 1 metric ton of N, yields the following figures (all auxiliary plant is included): Arc process, 60,000 kw. hrs. with no external fuel; Haber process, 2,700 kw. hrs. plus 4,000 kg. coke; Serpek process, 9,700 kw. hrs. plus 1,300 kg. coal; Cyanamide process, 16,900 kw. hrs. with no external fuel. C. G. F.

Ozone, its electrical production and technical uses. ALBERT CLARKE. *Beama* 8, 432-9(1921).—12 illus. A carefully prep'd. review. See *C. A.* 15, 2586. C. G. F.

Sparkover voltages through air. W. S. FLIGHT. *Beama* 8, 23-9(1921).—7 illus. C. G. F.

Electrical equipment of the Chuquicamata copper plant. SIEMENS SCHUCKERT. *Elektrochem. Z.* 27, 111-4(1921). C. G. F.

The electrodeposition of metals. W. E. HUGHES. *Beama* 8, 133-9, 239-47 (1921).—H. describes modern practice in prep'd. the work for plating: Cleaning by mechanical, chem. and electrochem. means. 4 interesting microphotos of deposited Fe and Ni are shown. Practical directions are given in prep'd. plating solns., the importance of the several constituents; the polishing and "finishing" of the plated articles, etc. C. G. F.

The electrodeposition of iron. W. E. HUGHES. *Beama* 8, 425-31(1921); 6 large microphotos.—A splendid survey of the art of depositing Fe, its com. applications, physical and chem. properties. The ferrous-Ca chloride bath and the sulfate bath are discussed at length. The macro- and micro-structures of the ptd. Fe are dwelt upon. A more serious study of the micro-structure of electrodeposited metals is strongly advocated. C. G. F.

Industrial electrosmosis. F. ROWLINSON. *Beama* 8, 341-5(1921).—After dwl'g upon the theory of osmosis R. briefly described the following com. processes: Dewatering of peat; purification of clay; Rogers-Bennett process for the extrn. of oils from both animal and vegetable sources; extrn. of sugar from sugar beets; the electrosmose tanning process. Clay treated by the electrosmose process is remarkably fine and plastic. In the Rogers-Bennett process 99.5% of the oil is set free. C. G. F.

Voltage reading on large battery easily taken by one man. JOHN E. McCARTHY. *Elec. World* 78, 375(1921).—Full illus. account of a simple piece of app. C. G. F.

Neon tube lighting. ANON. *Illum. Eng.* 14, 83-4(1921).—Brief account of the new Ne gas elec. signs in Paris and London. 2 illus. C. G. F.

The mercury arc rectifier of large capacity. R. L. MORRISON. *Elec. Rev.* (Chicago) 79, 171(1921).—Since the voltage drop in the Hg rectifier is approx. 12 the efficiency will increase with increase in operating voltage. Thus at 220 v. the efficiency is about 91.6% while at 1500 v. it reaches 98.5%. The 6 phase rectifier gives a much smoother current than the single phase, which fluctuates between 60% and the max. value. By the use of suitably designed choke coils with the 6 phase rectifier 2 or 3 anodes may be made to carry current and the amplitude of the undulations may be thus reduced to not more than 8% of the max. amplitude of the a. c. waves. Sealing large rectifiers caused trouble at first. Brown-Boveri & Co., whose app. is described in the article, use an arrangement of asbestos washers clamped between steel bolts with Hg poured into spaces provided around the bolt and anode insulator. Short circuiting once gave trouble but has been prevented by the use of better vacuum pumps. In the present design the arc operates between 6 anodes and a single Hg cathode in a large chamber. The vapors are condensed in a narrow upper chamber cooled by running water. Both cathode base and anode plates are water cooled. The arc is started by an ignition anode operated by the Fe core of a solenoid, the ignition current being provided by a small 110 v. converter. About 2 sec. are required to start the main arc. The starting current is then interrupted by the automatic action of the solenoid and a spring. Units of 1500 K. W.

capacity operating on 25 cycle currents at 550 v. have efficiencies of 93.5% at full load and 92.3% at 25% load. A 100 K. W. unit on a 50 cycle current would have efficiencies of 94% and 93%, resp. and a 500 K. W. unit 93.8% and 92.3% at these loads. These are better than rotary converter efficiencies at low load and slightly better at full load. It is particularly adapted therefore for fluctuating loads. **E. H. DARBY**

Magnetic properties of compressed powdered iron. B. SPEED AND G. W. ELMEN. *J. Am. Inst. Elec. Eng.* 40, 596-609(1921).—A new magnetic material is described which consists of compressed, powdered, electrolytic Fe and is used to replace fine hard drawn wires in small inductance coils and transformers such as are required for telephone circuits. Such app. requires a core material having a fairly const. permeability, low hysteresis and eddy current loss within the range of magnetizing forces and frequencies met with. By varying the pressure and insulation of the particles various grades are produced as required. Pressures up to 250,000 lbs. per sq. in. are used. The Fe is produced by electrolysis of a soln. of $\text{FeSO}_4 + \text{FeCl}_3 + (\text{NH}_4)_2\text{SO}_4$, anodes of mild steel and polished sheet steel cathodes being used. The brittle deposit is ground until 35-50% will pass a 200-mesh sieve. Insulation of the individual articles is obtained by rolling with flake Zn, sifting out the excess Zn and then mixing with shellac soln. The sp. gr. varies from 5.8 to 7.4 depending upon the condition of the Fe and the pressure applied. Annealed uninsulated particles pressed to 254,000 lbs. per sq. in. varied in permeability from 150 to 238 as B increased from 105 to 13,650. The same material under 50,700 lbs. pressure changed in permeability from 105-163 with increase in B from 200-2,650. Very complete tables of magnetic properties are given. Hysteresis losses at about 5000 B vary from 3000 to 15,000 ergs per cc. per cycle, depending upon pressure, method of annealing and insulation. As compared with other materials at $H = 60$, these Fe powder cores have a permeability of 48-156, cast Fe 620, cast steel 710, and pure solid Fe 7800. Grades B and C have practically const. permeability below $B = 100$. **W. E. R.**

Electrically heated glass-annealing leers (COLLINS) 19A. Coal research (FISCHER) 21. Conversion of radiant energy into light energy (MEYER) 2. Electrical precipitation of tar fog (FOXWELL) 21. Liquefaction of carbon (MÜNCH) 2.

BURGESS, CHARLES FREDERICK. *Applied Electrochemistry and Metallurgy.* A practical treatise on commercial chemistry, the electric furnace, the manufacture of ozone and nitrogen by high-tension discharges and the metallurgy of iron, steel and miscellaneous metals. Chicago: American Technical Society. 198 pp.

CLARKSON, RALPH PRESTON. *Elementary Electrical Engineering.* New York: D. Van Nostrand Co. 187 pp. \$2.00.

DENNY, CLAUDE W. *The Electrodeposition of Copper and its Industrial Applications.* London: New York: Sir I. Pitman and Sons. 108 pp.

DEUTSCHE BELEUCHTUNGSTECHNISCHE GES. *Die Leuchtechnik.* A collection of papers on various illuminating engineering topics by well known German authorities. 128 M. H. Lux, Berlin W. 57.

DICKMANN, HERBERT. *Bibliographie über die Darstellung des Roheisens im elektrischen Ofen.* Düsseldorf: Verlag Stahleisen m.b.H. M 6. For review see *Stahl u. Eisen* 41, 1160(1921).

KYSER, H. *Die elektrische Kraftübertragung.* Berlin: Julius Springer. 405 pp. Bound M 90.

PERCIVAL, G. A. *The Electric Lamp Industry.* London: Sir Isaac Pitman and Sons, Ltd. 112 pp. 3s. net. For review see *Illum. Eng.* 14, 85(1921).

PRING, J. N. *The Electric Furnace.* London: Longmans, Green and Co. 485 pp. 32s.

New stripping film. B. KROSIK. *Phot. Rundschau* 57, 57-65(1921).—A new German paper-backed film is described. In addition to its low price as compared with plates of ordinary film, it has all the merits and demerits of celluloid films, and is handled like them. Stripping is easily accomplished after drying. The film has better resolving power than translucent negative paper, but is not equal in this respect to highly sensitive plates. It is particularly suited to X-ray work.

I. DERR

Developing negatives by compensation. F. W. FRERK. *Wiener Mitt.* 1920, 113-7; *Chim. & ind.* 5, 563-4(1921).—As metol softens images, hydroquinone hardens them, and K_2CO_3 increases the reducing power, F. proposes using the following 3 solns., the effects of which compensate those of abnormal exposition, and he thus succeeds in saving negatives which have been overexposed 20, 30, and even 120 times: (I) H_2O 1 l., metol 14 g., Na_2SO_4 140 g.; (II) H_2O 1 l., hydroquinone 18 g., Na_2SO_4 100 g.; (III) H_2O 1 l., K_2CO_3 150 g. 10% KBr soln. is used. For under-exposure develop warm, and use 2 parts of I, 2 of III, 3-4 vols. of H_2O , no KBr. For normal exposure develop at 18°, use equal parts I, II, and III, 4-6 drops KBr, and 2 vols. of H_2O . For portraits add 0.25-0.5 of III, for line drawings none of I, and for architectural drawings decrease the amt. of I. For over-exposure develop cold, and use 0-0.5 of I, 2-4 of II, 0-0.5 of III, 10-30 drops of KBr, and no H_2O . The vols. of H_2O to be added are calcd. on the total vol. of the developer.

A. P.-C.

Prevention and removal of photographic stains on the hands. A. ULRICH. *Wiener Mitt.* 1920, 195-7; *Chim. & ind.* 5, 672(1921).—The following may be used as a preventive: 50 cc. distd. H_2O , 80 cc. glycerol and 1 g. agar are shaken at frequent intervals for several days, filtered through muslin, and mixed on the water-bath with the following mixt.: distd. H_2O 80 cc., Na_2CO_3 3 g., stearin 5 g., ordinary (?) oil 5 g., until there is formed a white ointment which is spread on the hands before starting work. Pyro and $AgNO_3$ stains may be prevented or removed by means of the following mixt.: H_2O 100 cc., Na_2SO_4 100 g., bleaching powder 50 g.; or of H_2O 100 cc., HCl 5 g., $H_2C_2O_4$ 1 g., phosphoric acid 3 g. Staining with metal may be prevented by treating with a mixt. of equal parts of glycerol and spirits of camphor to which are added 30-40 drops of liquid phenol. U stains are easily removed by means of NH_4OH or of K_2CO_3 soln. Chapping of the hands due to frequent use of bichromate is easily prevented by treating the hands with ointment before and after working.

A. P.-C.

Artistic metal etching and inlaying (WERNER) 9.

GUTTMANN, EUGEN: Die Selbstbereitung von Bromoldruckfarben. Halle: W. Knapp.

HÜBL, ARTHUR: Die orthochromatische Photographie. Halle: W. Knapp.

KÖGEL, P. R.: Die Palimpsestphotographie (Photographie der radierten Schriften) in ihren wissenschaftlichen Grundlagen und praktischen Anwendungen. Halle a. S.: Verlag Wilhelm Knapp. M 18.60. For review see *Atelier* 28, 139(1921).

MERCATOR, G.: Anleitung zum Kolorieren photographischer Bilder jeder Art mittels Aquarell-Lasur-Öl Pastell und anderen Farben. Halle a. S. Verlag Wilhelm Knapp. M 7.80. For review see *Atelier* 28, 139(1921).

TRIVELLI, A. P. H. AND SHEPPARD, S. E.: The Silver Bromide Grain of Photographic Emulsions. New York: D. Van Nostrand Co. 8 Warren St. 143 pp. \$2.50.

Photography. SOC. ANON LA CELLOPHANE. Brit. 162,266, Jan. 24, 1921. In prep. sensitive cellulose and like films permeable to H_2O the film is impregnated with a soln of a single silver halogen salt or a mixt. thereof in a suitable solvent and the silver

halogen salt ptd. within the film by the action of a second bath which may consist simply of H_2O . In one example the film is impregnated with a satd. soln. of AgI in KI and subsequently soaked in H_2O with the object of setting free the AgI which is deposited in the interior of the film, leaving it sensitive.

Colored photographic prints on metal. P. V. SNOW. U. S. reissue 15,103, May 10. See original pat. No. 1,348,140; *C. A.* 14, 2588.

Photomechanical printing-surfaces. M. DE SPERATI. Brit. 162,640, Feb. 1, 1921. A photographic negative is converted into a printing-surface by resensitizing the negative with dichromate and exposing it from the back. Negatives on glass or on flexible films can be used to obtain rigid or flexible printing-surfaces. Reproductions from negatives which it is not desired to destroy can be used and negatives with images broken up by dots may be used. The Ag image is first treated in a bath of $HgCl_2$ and NH_3 to make the image portions more absorbent to H_2O and more repellent to ink. The negative is then resensitized with dichromate and printed through the back. The original image may be dissolved out before or after resensitizing. The resensitized negative, after exposure, is washed in running H_2O . It may then be dried and, when required for printing, prep'd. by a bath of H_2O , glycerol, and NH_3 , prior to inking.

Imitating paintings. H. P. G. STEEDMAN. Brit. 162,140, Feb. 26, 1920. Oil paintings are reproduced by exposing to light a sensitized sheet of gelatin or other suitable material under a photographic negative, or a positive therefrom, prep'd. from the original painting or a painted copy, developing the exposed sheet to remove the unaffected parts, washing, drying, and hardening the sheet, as by applying $HCHO$ so as to form a matrix having variations in surface level of the painted parts of the original. From this matrix a die is prep'd., preferably from plastic casein, wherewith printed copies of the original may be embossed so as to resemble the original. The gelatin, etc., sheet is incorporated with $NaCl$ and a mucilage of linseed oil, to which is added chrome alum and a sensitizing material such as "bichromate of potash and ammonia." The plastic casein is introduced into a frame enclosing the matrix, is rolled and pressed therein, and is subsequently dried and hardened to form the embossing die, which is applied to the face or back of the print, corresponding, resp., to the use of a photographic negative or positive; or both a male and a female die may be used between which the prints are embossed. The following methods of prep'g. the plastic casein are described, *viz*: (I) Casein mixed with CaO or other alk. material is converted into a plastic mass by the action of H_2O . (II) Sulfonated rape oil is mixed with dried powdered casein and kneaded into a homogeneous mass, to which resin or caoutchouc and chalk or CaO may be added, the product being hardened by vulcanizing with S or by applying $HCHO$. (III) Milk is heated to $140^{\circ} F.$, borax is added and the temp. raised to $190^{\circ} F.$ in the presence of $BaCl_2$ or other mineral ppt. of casein, the ppt. pressed and ground with an addition of $HOAc$, soda or other solvent and the resulting mass steam heated. (IV) Casein is made into a plastic mass with an aq. soln. of borax, the excess H_2O removed and nitrocellulose added, the whole being then kneaded into a homogeneous mass. Cf. 15,108, 1911.

Nitrocellulose composition. P. C. SEEL. U. S. 1,379,506. May 24. A compn. adapted for the manuf. of films is formed of nitrocellulose 50, triphenylphosphate 5-50, and fusel oil 10-60 parts mixed with $MeOH$ and acetone.

Nitrocellulose compositions. P. C. SEEL, H. COMBS and R. KEMP. U. S. 1,380,258. May 31. Compns. suitable for the manuf. of photographic films are formed of nitrocellulose together with alcs. contg. 4 or 5 C atoms, *e. g.*, amyl or butyl alcohols, and a volatile common solvent such as $MeOH$ and acetone.

6—INORGANIC CHEMISTRY

H. I. SCHLESINGER

The system iodine-tellurium. A. DAMIENS. *Bull. soc. chim.* 29, 512-28(1921).—See *C. A.* 15, 1845 E. H.

Reaction of chlorine and trichlorobromomethane in the dark. ALEXANDRA V. RANKE. Univ. Berlin. *Z. Elektrochem.* 27, 365-7(1921); cf. preceding abstract.—The velocity of the reaction between Cl_2 and CCl_3Br has been studied at 100° in the dark. The velocity with which Br is set free decreases proportionally to the diln. with CCl_4 . From this it follows that free Cl atoms do not act primarily. The course of the reaction is illustrated by the following equations: (1) $\text{Cl}_2 + \text{CCl}_3\text{Br} = \text{CCl}_4 + \text{Cl} + \text{Br}$, (2) $\text{Cl} + \text{CCl}_3\text{Br} = \text{CCl}_4 + \text{Br}$, and (3) $\text{Br} + \text{Br} = \text{Br}_2$. H. JERMAIN CREIGHTON

The chemical behavior of zirconium. F. P. VENABLE. *J. Elisha Mitchell Sci. Soc.* 36, No. 3 and 4, 115-22(1921).—A paper dealing principally with the hydrolysis of Zr salts. H. W. EASTERWOOD

Chlorination by mixed carbon monoxide and chlorine. F. P. VENABLE AND D. H. JACKSON. *J. Elisha Mitchell Sci. Soc.* 35, No. 3 and 4, 87-89(1920).—It was found that mixts. of CO and Cl_2 gave successful chlorinations. The following chlorination temps. were obtained with CO in excess: ZrO_2 480° ; SnO_2 400° ; MgO 475° ; Al_2O_3 450° ; Fe_2O_3 460° ; Cr_2O_3 625° ; MnO_2 460° ; U_3O_8 500° . With Cl_2 in excess chlorination temp. was detd. for ZrO_2 425° ; Fe_2O_3 370° . H. W. EASTERWOOD

Boron and silicon chemistry. Experimental investigation of very volatile material. ALFRED STOCK. *Ber.* 54A, 142-58(1921).—This is a résumé of S.'s very numerous contributions to the knowledge of the properties of B and Si. A subject index to the articles in which the various parts of S.'s vacuum app. are described is included. The general availability of this app. for exact chem. and physical work with substances having a b. p. below 200° is pointed out, particularly when only small amts. of material are available. Admitted objections are high first cost, difficulty of installation and large amts. of Hg and liquid air required. A photograph of the app. as installed in S.'s lab. is included. To those interested in this field this résumé will be of great value as a means of ready reference to S.'s already voluminous publications. A. R. MIDDLETON

Preparation of water-free hydrocyanic acid. K. ZIEGLER. Marburg. *Ber.* 54B, 110-12(1921).—A description is given of an app. for the convenient prepn. of HCN from NaCN and H_2SO_4 . GEORGE W. MOREY

Ferric-oxalic acid (malonic acid) compounds. R. F. WEINLAND AND FR. W. SIERP. *Z. anorg. allgem. Chem.* 117, 59-83(1921).—Only complex anions of $\text{Fe}^{'''}$ with $\text{H}_2\text{C}_2\text{O}_4$ were hitherto known; this investigation concerns the possibility of complex cations. As pyridine (Py) was known to form readily complex compds. of $\text{Fe}^{'''}$ with other org. acids, the action of Py and $\text{H}_2\text{C}_2\text{O}_4$ on FeCl_3 was tried in widely varying proportions, both in aq. and Et_2O solns. Only complex anions resulted contg. also Cl and having Py, etc., in the cation. Salts of 3 types of *chloro-oxalato-ferric acids* were prep'd.: (1) $\text{H}[\text{FeC}_2\text{O}_4\text{Cl}_2]$; (2) $\text{H}_2[\text{HOF}(\text{C}_2\text{O}_4)_2\text{Cl}]$; and (3) $\text{H}_3[\text{Fe}(\text{C}_2\text{O}_4)_2\text{Cl}_2]$. Salts of (1) result only from solns. which contain the components in the calcd. amts.; only these are capable of recrystn. from water; salts of the other types can be obtained from solns. of widely varying compn. Of (1) were prep'd. the Py and quinoline salts, both anhydrous and yellow; of (2) the K, Py (1 H_2O) and guanidine salts, greenish yellow; of (3) the 2Py (1 H_2O) orange-yellow, and 3Py, orange, salts. All are readily sol. in water with acid reaction; the Py salts of (2) and (3) on recrystn. from water form $\text{HPy}[\text{Fe}(\text{H}_2\text{O})_2(\text{C}_2\text{O}_4)_2]$. AcONa reddens their aq. solns. in proportion to $\text{Cl}:\text{C}_2\text{O}_4$, i. e., most in salts of (1), least in salts of (2). In all 3 types Cl could be replaced by SO_4 but not by Br or NO_3 . Of *sulfato-oxalato-ferric anions* were prep'd. of type (1) the quinoline (1 H_2O)

salt, gray-green, small plates; of (2) the 2Py salt, yellow green; of (3) the 2Py salt, yellow. Attempts to prep. a 3Py salt resulted in decompn. Of *trioxalato salts* were prep'd.: $H_3Py_3[Fe(C_2O_4)_3] \cdot 3H_2O$, emerald-green hexagonal plates, and $H_4Py_3[Fe(C_2O_4)_4] \cdot 0.5H_2C_2O_4$, pale, yellow-green scales; also the diquinoline salt, $H_2(C_6H_5N)_2[Fe(C_2O_4)_4] \cdot 9H_2O$, long, double-pointed, greenish yellow needles. The first and second salts result from solns. of the same compn., the first below 0° , the second at room temp. The compn. and individuality of the latter were thoroughly established; it recrysts. from water without loss of the $0.5H_2C_2O_4$ nor is this removed if its equiv. of Py is added to the soln. This occurrence of $H_2C_2O_4$ without the complex anion is unparalleled in the K, Na and NH_4 trioxalato ferrates and in the trioxalato-chromates, manganates and aluminates. Only the stanniate $K_2[Sn(C_2O_4)_3] \cdot 0.5K_2C_2O_4 \cdot 2.5H_2O$ is comparable. In the *dioxalato-diaquo series* were prep'd.: $HPy[Fe(H_2O)_2(C_2O_4)_4]$, green cryst. aggregates; the same with $0.5H_2O$, yellow-green fine needles; $HC_6H_5N[Fe(H_2O)_2(C_2O_4)_4] \cdot H_2O$, greenish yellow, very fine powder. Attempts to prep. chloromalonato ferrates yielded only *diaquodimalonato salts* of which the Py ($2H_2O$), dirty-white rhombohedrons, the *quinoline*, very pale green, short needles, and the *guanidine* ($1H_2O$), pale green, short needles, are described. Attempts to prep. chlorooxalato (malonato) ferroates were unsuccessful but from $FeCl_3$, malonic acid and Py a nonelectrolyte, $\left[\begin{array}{c} Py \\ | \\ H_2O \\ \nearrow \\ Fe \\ \searrow \\ O_2C \\ \diagup \\ CH_2 \\ \diagdown \\ O_2C \\ \searrow \\ H_2O \end{array} \right]$, yellowish, cryst. powder, with green tinge, slightly sol. in water, was obtained. The observation of Eder and Valenta (*Monatsh.* 1, 772 (1880)) as to the reactivity of oxalatoferriates toward light with partial reduction of Fe and change of color was confirmed in both chloro- and sulfato salts. Full details of the prepn. and analysis of the 19 new salts are given.

A. R. MIDDLETON

Action of alkaline hydrogen peroxide on silver solution and reaction of silver with dilute sulfuric acid. E. SALKOWSKI. *J. prakt. Chem.* 102, 194-208 (1921).—In presence of $NaOH$ or KOH a small amt. of H_2O_2 forms a black ppt. which becomes gray as more H_2O_2 is added. The extensive quant. investigation of the compn. of the ppt. here recorded shows it to be a mixt. of Ag and Ag_2O in which Ag increases with increasing concn. of H_2O_2 to a max. of about 60% when the concn. of H_2O_2 is about 1%. Analytical data indicated, but did not absolutely prove, absence of Ag_2O . Two tests for Ag_2O were devized, both of which indicated its absence in the ppts. analyzed. (1) Ag_2O boiled for a few min. with excess of an aq. soln. of an amino fatty acid, best, on account of their greater solv., glycine or alanine, gives after brief standing a fine mirror; Ag_2O does not. Five % of Ag_2O in Ag_2O suffices to give a good mirror. (2) When Ag_2O is covered with HNO_3 (sp. gr. 1.2) a deep brown soln. results which in the cold fades very gradually but with warming becomes brighter and finally colorless. Pure Ag can be prep'd. in a very stable black form by mixing 20 cc. of 10% dextrose soln. with 5 cc. of $NaOH$ (sp. gr. 1.16), and then adding all at once 10 cc. of 3% $AgNO_3$. Pptd. Ag is practically insol. in 10% H_2SO_4 (0.5%) but in presence of Ag_2O its solv. is largely increased. A. R. MIDDLETON

Hexachlororuthenates. F. KRAUSS. *Z. anorg. allgem. Chem.* 117, 111-20 (1921).—By addn. of a 5% soln. of the alk. chloride to a soln. of $RuCl_4$ contg. 1.7% Ru the complex salt was at once ptd., filtered, washed with warm dil. HCl and dried in air between filter paper, then in a desiccator. The Cs salt was obtained as small, deep red-brown crystals, homogeneous under the microscope. Detns. of Ru and Cl were in close accord with $Cs_2[RuCl_4] \cdot H_2O$. Rb and K salts were not homogeneous, contg. apparently small emts. of the pentachloro compd. H_2S ptd. Ru quant. from the Cs and Rb salts but only partially form the K salt with formation of the usual blue soln. From the warm HCl soln. of all 3 salts KOH ppts. green flocks. The prepn. of this new type of salt removes the supposed distinction between the prepn. of hexachlororuthenates of org. NH_4 derivs. and those of the alk. metals. A. R. M.

Existence of hydrates in aqueous solutions (SMITS, *et al.*) 2. Electromotive behavior of magnesium (SMITS, BREX) 2. Double decomposition in heterogeneous systems (RAMANN, SALLINGER) 2. Chemico-crystallographic notes (STEINMETZ) 2.

NORRIS, JAMES FLACK: A Textbook of Inorganic Chemistry for College. New York: McGraw-Hill Book Co.

PARKINGTON, JAMES RIDICK: Textbook of Inorganic Chemistry for University Students. New York: Macmillan Co. 1066 pp. \$8.00 net.

7—ANALYTICAL CHEMISTRY

WILLIAM T. HALL

Iodometric acetone determination. P. H. HERMANS. Delft. *Chem. Weekblad* 18, 348 (1921).—In connection with a research on the equil. between Me_2CO and diolein, H. has worked out an accurate iodometric method for detg. Me_2CO quant. in aq. solns. varying greatly in concn. The results obtained vary with the conditions which, however, can be detd. for any given diln. For each detn. he uses 25 cc. of approx. 0.2 *N* I (which is sufficient for a max. of 42–4 mg. Me_2CO ; calcd. 48 mg.); it is advisable not to go above this margin. To the aq. Me_2CO soln. is first added the necessary amt. of KOH soln., then from a pipet the necessary amt. of 1 soln. at room temp.; if *too much* or *too little* alkali is added the iodination is not complete, even after long standing. Concerning the necessary quantities to be added the following table will suffice for all practical purposes:

Volume of the Me_2CO soln.	Cc. of 1.5 <i>N</i> KOH.	Iodination is quantitative after.
20 cc.	10–15	1–2 min.
100 cc.	25–30	3–5 min.

VINCENT VERMOOTEN

Modification in the Kossel-Neumann method for the determination of phosphorus in organic substances. MARIO A. MANCINI. *Biochim. ter. sper.* 8, 4–7 (1921).—In the study of nuclein derivs. discordant results were obtained by the Kossel-Neumann method. The effect of varying amts. of NH_4NO_3 , H_2SO_4 , and $(\text{NH}_4)_2\text{SO}_4$ upon the MoO_3 content of the phosphomolybdate ppt. was therefore studied. It was found that variations in the amts. present caused considerable variations in the compn. of the ppt. (The work of Falk and Sugiura in this connection is mentioned, *C. A.* 9, 1725.) M. prefers the following method:—Weigh out 0.5 g. of the substance into a 200 cc. Kjeldahl flask and pour onto the sample 6–8 cc. H_2SO_4 (d. 1.184). Heat and boil 1 hr. Remove from the flame and add drop by drop HNO_3 (d. 1.4) with care, and replace on the flame until evolution of oxides of N ceases. Repeat the operation 4 or 5 times. When oxidation is complete the liquid will be clear and light yellow in color. Wash into a beaker with hot H_2O , add NH_4OH to alk. reaction; add 30–40 cc. of 40% NH_4NO_3 and 20 cc. 25% HNO_3 . Heat to 100° and add 120–140 cc. boiling 3% soln. of $(\text{NH}_4)_2\text{MoO}_4$. Let stand at least 2 hrs. Filter and wash with a hot soln. contg. 50 cc. HNO_3 and 50 g. NH_4NO_3 per l. The ppt. is then dissolved through the filter into another beaker with hot 25% NH_4OH , and washed with hot H_2O until the wash water gives no test with Nessler's reagent. Add 50 cc. of ammoniacal magnesia mixt. and let stand 24 hrs. The ppt. is then filtered off, washed, and ignited in the usual manner to $\text{Mg}_2\text{P}_2\text{O}_7$. A series of analyses is given which shows very concordant results. H. W. BANKS, 3rd

Table for the determination of dextrose, invert sugar and levulose according to the thiocyanate-potassium iodide method. G. BRUHNS. *Chem.-Zig.* 45, 486–7 (1921).—Details of a method previously published (*C. A.* 12, 2293; 13, 939) for the quant. detn.

of Cu or sugars by KCNS and KI are repeated. A table showing the mg. of dextrose, invert sugar or levulose, corresponding to cc. of $\text{Na}_2\text{S}_2\text{O}_3$ used in the final titration, is now published to supplement the former table, which was for the calcn. of invert sugar in the presence of sucrose.

H. S. BAILEY

Calcium chloride method for the determination of water in gasoline and in certain other substances. CHARLES W. CLIFFORD. *J. Ind. Eng. Chem.* 13, 628-31 (1921).—The CaCl_2 method, which is given in detail, is accurate for gasoline, benzene, CHCl_3 , CCl_4 and CS_2 but is not accurate for liquids miscible in water.

D. K. FRENCH

The detection of nickel in steel. PH. M. KOENIG. *Chimie & industrie* 5, 547 (1921).—A modification and simplification of the Chugaev-Brunck method of detecting Ni in steel. (A) The surface of the piece of steel (polished if need be with a file or with emery paper) is moistened with a few drops of 1:1 HCl; after half a min. it is rendered alk. with 1:1 NH_4OH , and dimethylglyoxime test paper (filter paper impregnated with a 1% alc. soln. of dimethylglyoxime and air-dried) is applied. In the presence of Ni there appears immediately a bright carmine coloration. (B) The surface of the steel is prepnd. as above, 2-3 drops of dimethylglyoxime soln. are added, a piece of ordinary filter paper is applied, and the surface is touched with a glass rod which has been dipped in 1:1 NH_4OH . This method of detection is very rapid (1 min.) and permits the classifying of batches of bars in the field without having to sample them. It is, moreover, very useful for detecting Ni after a micrographic or macrographic examn.

A. P.-C.

BAUDISCH, OSKAR: Einige Fortschritte auf dem Gebiete der analyt. Chemie. Stuttgart: Ferdinand Enke M 2.50.

BENEDICT, FRANCIS GANO: Elementary Organic Analysis. The Determination of Carbon and Hydrogen. Easton, Pa.: The Chemical Publishing Co. 82 pp. \$1 net.

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HASIWETZ, H.: Anleitung zur qualitativen chemischen Analyse. 6th Ed. by G. Vortmann. Wein: Frans Deuticke's. M 6. For review see *Chem. Tech. Ztg.* 39, 24 (1921).

HILL, ARTHUR E.: A Brief Laboratory Guide for Qualitative Analyses. 3rd Ed. Revised. Easton, Pa.: The Chemical Publishing Co. 104 pp. \$1.25.

SCOTT, WILFRED WELDAY: Qualitative Chemical Analysis. New York: D. Van Nostrand Co. 350 pp. \$3.00.

TOWER, OLIN FREEMAN: A Course of Qualitative Chemical Analysis of Inorganic Substances. Philadelphia: P. Blakiston's Son and Co. 89 pp. \$1.50.

WHITE, GEORGE FREDERIC: A Laboratory and Class-room Guide to Qualitative Chemical Analysis. 2nd Ed. rev. and enl. New York: D. Van Nostrand Co. 171 pp.

8—MINERALOGICAL AND GEOLOGICAL CHEMISTRY

EDGAR T. WHERRY AND WALTER F. HUNT

Tear-figures on certain minerals. III. MIKIO KUHARA. *Mem. Coll. Eng. Kyoto Imp. Univ.* 2, 53-62 (1918); cf. *C. A.* 13, 19.—Faces of crystals were subjected to light percussion of a needle point, the resulting cracks forming the "tear-figs." Aragonite, K-alum and borax crystals were thus studied. In aragonite the symmetry of etch-figs. and of tear-figs. on the same face are concordant, though the shape of the figures may vary. "By an examn. of the tear-figure we can know the character of the twinning-plane and of the composition-face of a certain mineral". A sharp point produces a radial figure, a dull point a polygonal figure. IV. *Ibid* 71-82.—In the previous

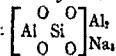
papers tear-figs. on crystals of the regular, rhombic, hexagonal and monoclinic systems were discussed. This paper reports the results of a study of tear-figs. on wulfenite and CuSO_4 crystals, of the tetragonal and triclinic systems, resp. In general the symmetry of a tear-figure is quite concordant with that of the mother crystal, that is to say, the number of the plane or axis of symmetry of the former is equal to that of the symmetry plane of the latter which perpendicularly cuts the face on which the tear-figure stands and they are always parallel. A cleavage plane must be parallel to a certain wall or crack of a tear-figure but the gliding plane is never parallel to the latter unless it coincides with the cleavage plane.

L. W. RIGGS

Melting and boiling point of minerals. II. L. H. BORGSTRÖM. *Övers. Finska Vetensk. Soc. Förh.* 59A, No. 16, 14 pp. (1917); continuation of *C. A.* 9, 2364.—For practical purposes the ratios between the b. ps. of liquids, on the abs. scale, are the same at all pressures. Using Cl_2 as standard of reference, this relation is shown to hold for a number of org. and inorg. substances. Extending the method to substances of geological interest, the approx. b. p. is calcd. for 14 minerals at 93 atm. pressure, corresponding to a depth of 1000 meters, if only hydrostatic pressure is concerned, or less depth the greater the sp. gr. of the earth-material acting. The results range from 305° for H_2O and 790° for Hg to 2830° for sylvite (KCl) and 2870° for Pb . Even at such moderate depths as 1000 m. the pressure is sufficient to prevent the boiling of many sulfide minerals. Considering the phenomena of dissociation similarly, it is concluded that the dissoc. temp. of pyrite is raised by pressure to such an extent that this mineral can cryst. from a molten magma at depths of but little more than 400 meters; for actual measurement gives its dissoc. pt. at atm. pressure as 690°. The corresponding pts. for other minerals are: chalcopyrite, 620°, tennantite 630°, arsenopyrite 700° and glauconite 660–700°.

E. T. W.

Remarks on the causes of mineral colors. JOHANN JAKOB. Naples. *Z. Krist.* 56, 194–8 (1921).—Some minerals are colored by essential constituents, others by foreign substances. In the latter group much difference of opinion exists as to the nature of the effect. The work of P. Pfeiffer on halochromic phenomena (*C. A.* 5, 3581, 3829, etc.) has shown how addition of SnCl_4 can produce colors in colorless org. compds. Similar explanations can be developed for certain colored silicates on the basis of J's. new constitutional formulas (*C. A.* 15, 36). Nepheline, which is written:



has the power of taking up in its second sphere additional at. groups, such as Na_2S and Na_2S_2 . This yields ultramarine, with its deep blue color. Similarly sodalite, noseite, hayunite, etc. can become colored, either by taking up traces of Na_2S or from unsatd. Cl. The disperse ("dilut") coloration of mineral is, therefore, a simple chemical, not a colloidal, phenomenon.

E. T. W.

Some observations concerning mineral paragenesis and succession at Langban-shyttan. G. AMINOFF. *Geol. Fören. Förh.* 40, 535–46 (1918).—In the course of crystallographic study of the minerals from this locality (*C. A.* 13, 3117; 14, 1097; 15, 220), A. has collected data on paragenesis, which are presented in detail. The minerals may be grouped as follows: (4) Belonging to the ore-impregnated dolomite; (1) berzelite-hedyphane associations, including besides these minerals schefflerite, rhodonite, and sometimes barylite; (2) penninite association, comprising hematite, the penninite minerals, barite of type E, calcite M (*loc. cit.*) and Pb. In druses in the dolomite: (3) scheelite assoc., with calcite K; (4) tilasite D assoc., with calcite L and hematite B. (2) Belonging to the garnet-skarn: (5) inesite-actropite assoc., with these and barite A, calcite and garnet B. (C) Characteristic of the garnet-rhodonite skarn: (6) thau-masite-apophyllite assoc. (D) Belonging to the granular vein-calcite: (7) Lead-pyrochroite assoc., comprising serpentine, barite, calcite, allactite, pyrochroite, pseudo-

pyrochroite, manganocalcite, fluorite, tilasite C, hematite, manganite, hausmannite B, Pb, Cu, and 2 as yet not fully investigated minerals; (8) pyroaurite-tilasite B assoc., in which calcite is the first to crystallize; and (9) margarosanite-nasonite assoc., comprising margarosanite, schefflerite, nasonite, calcite, apophyllite, thaumasite, Pb, also with 2 not yet investigated minerals. E. T. W.

Realgar. R. PILZ, R. SCHRODER AND V. THOST. Heidelberg. *Beitr. Kryst. Min.* 1, 173-80(1918).—Measurements on crystals from 3 localities confirmed the previously accepted value for the axial ratio of the mineral, but yielded 17 new forms. F. BUCHLER AND V. GOLDSCHMIDT. *Ibid.* 181.—Crystallographic. E. T. W.

The symmetry of rock salt. V. ROSICKY. Prague. *Beitr. Kryst. Min.* 1, 241-56 (1918).—Previous studies of etching figures on halite are reviewed, and new expts. described. For etching, concd. solns. of NaCl were used, to which had been added H₂O, Na₄B₄O₇, KCl, HNO₃, C₂H₄O₂, Na₂CO₃, or HCl. While in agreement with previous workers, symmetrical etch figures were often obtained, unsymmetrical, gyrohedral, figures were also quite definitely produced. These are always turned toward the right, as has been observed in sylvite. The material used was shown to be pure NaCl by detn. of its sp. gr., which came out 2.167, in good agreement with previous detns.; and also by spectroscopic examn., which showed the absence of K, Li and other metals. It is, therefore, to be concluded that rock salt, NaCl, is not holohedral, but has at most tetartohedral symmetry. E. T. W.

Investigation of rock salt as to pyroelectricity. V. POSEJPAL. Prague. *Beitr. Kryst. Min.* 1, 257-60(1918); cf. preceding abstract.—Rock salt was studied in a Kippel electrometer of small capacity and great sensitivity. No electrical properties could be detected, although the instrument was capable of recording 1/1000 the electrification shown by boracite. E. T. W.

The end figures and solution velocity of fluorite. H. BAUHANS AND V. GOLDSCHMIDT. Heidelberg. *Beitr. Kryst. Min.* 1, 219-40(1918).—Spheres of clear fluorite were subjected to the action of HNO₃ in a specially constructed shaking app. The concn. of the solvent ranged from 5 to 40%. As in other substances, the etching first brought out certain nodes and important forms, while ultimately an end figure was produced, in this case approaching a dodecahedron with curved faces, or more accurately, a trisoctahedron. The soln. velocity was found to increase continually, reaching a max. when the end figure had become fully developed. While the relative soln. effect is independent of the strength of the acid, the soln. velocity is proportional to the square root of the concn. of acid. The significance of these results for the theory of soln. processes in general is discussed. E. T. W.

Rutile from Traversella. F. P. MÜLLER. Basel. *Beitr. Kryst. Min.* 1, 159-65 (1918).—Crystals which occur in glaucophane schist are described crystallographically. E. T. W.

A pseudorhombic calcite twin. K. MIELEITNER. Munich. *Z. Krist.* 56, 193-4 (1921).—A crystallographic description. E. T. W.

Orientite, a new hydrous silicate of manganese and calcium from Cuba. D. F. HEWITT AND EARL V. SHANNON. *Am. J. Sci.* 50, 491-506(1921).—As the mineral is known to occur in the Costa and other claims in Oriente Province, 6 mi. south of Bueycito, where many Mn deposits are found, it is named *orientite*. Associates are psilomelane, manganite, calcite and hydrous silicates. A study of sections indicated the following tentative order of genesis: "bayate," glauconite, psilomelane, manganite (plumose), barite, orientite, manganite (prismatic), quartz, zeolites, calcite. Orientite forms crystals of the rhombic system, the largest not more than 1 mm. in length, light brown in color when free from impurities, brittle, H=4.5 to 5.0, sp. gr.=3.05. Optically it is biaxial, with the optic plane parallel to *c*(001), $\alpha=1.758$, $\beta=1.776$, $\gamma=1.795$.

Crystallized orientite is unattacked by cold dil. HCl but is readily sol. in hot HCl with the evolution of Cl and the sepn. of flocculent SiO_2 . It is practically insol. in concd. HNO_3 but is partly decompd. by boiling moderately concd. H_2SO_4 , yielding a rose purple soln. which becomes brown on diln. by pptg. manganese hydroxide. Chem. analyses of 3 carefully selected samples gave the following average: SiO_2 32.48, Al_2O_3 1.08, Fe_2O_3 1.56, MnO 29.92, O 3.27, CaO 22.47, H_2O -0.03, H_2O + 7.93, sum 98.74%. MgO , ZnO and Cl were present in traces. This leads to the formula $4\text{CaO} \cdot 2\text{Mn}_2\text{O}_3 \cdot 5\text{SiO}_2 \cdot 4\text{H}_2\text{O}$, or $\text{Ca}_4\text{Mn}^{'''}\text{(SiO}_4)_5 \cdot 4\text{H}_2\text{O}$.

L. W. RIGGS

Description of ferroanthophyllite, an orthorhombic iron amphibole from Idaho, with a note on the nomenclature of the anthophyllite group. EARL V. SHANNON. *Proc. U. S. Nat. Museum* 59, 397-401 (1921).—The specimen studied was from the Tamarack-Custer mine near Gem, Coeur d'Alene district (No. 93998 U. S. N. M.). From the associated minerals it evidently occurred in the ore of a galena-bearing vein. The specimen consists of fibrous masses, grayish-green in color when dry, olive green when moist. It separates readily into fine silky fibers, with sp. gr. 3.24. Before the blowpipe it fuses to a black magnetic slag; when fused with a large excess of Na_2CO_3 it reacts for Mn, $\alpha=1.663$, $\gamma=1.685$, β not detd. Analysis gave: SiO_2 49.30, Al_2O_3 1.30, Fe_2O_3 2.15, FeO 30.50, MnO 3.48, CaO 10.73, MgO 0.66, H_2O -0.18, H_2O + 2.13, sum 100.43%. The formula derived is $(\text{Fe}, \text{Ca}, \text{H}, \text{Mn})\text{O} \cdot \text{SiO}_2$, or RSiO_3 , with R=Mn: Ca:H:Fe=2:8:5:17. The nomenclature is discussed in connection with that of Palmgren's "Eisen Anthophyllit" from Sweden (*C. A.* 13, 1197), ferroanthophyllite being proposed for the Fe end member of the anthophyllite group. L. W. RIGGS

The röntgenographic derivation of the symmetry and element of molybdophyllite. G. AMINOFF. Stockholm. *Geol. For. Förl.* 40, 923-38 (1918).—This mineral is a hydrous silicate of Pb and Mg seemingly related to calamine. It occurs in flakes the properties of which show it to be hexagonal in crystn. X-ray photographs of cleavage flakes were made, and showed plainly that the symmetry is really trigonal, with axis $c=$ about 0.549. Comparison with friedelite, which has $c=0.532$ to 0.562, showed close similarity in the X-ray diagrams. Pyrosmalite yielded a somewhat similar diagram. If the formulas are written as metasilicates, to bring out analogy with the carbonates, many of which are also trigonal (rhombohedral), friedelite is $\text{H}_2(\text{R}''(\text{OH}, \text{Cl}))(\text{SiO}_3)_3$ and molybdophyllite becomes $(\text{R}''\text{OH})_2\text{SiO}_3$, a more basic salt of the same acid.

E. T. W.

Crystallography and chemical composition of creedite. WILLIAM F. FOSHAG. *Proc. U. S. Nat. Museum* 59, 419-24 (1921); cf. Larsen and Wells, *C. A.* 10, 2336.—The specimen studied was from a large suite (No. 93117 U. S. N. M.) obtained from Wagon Wheel Gap, Creede Quadrangle, Colorado. It was found in 2 modes of association; one with fluorite, either as crystals in cavities, or as imbedded radiated masses of crystals in white saccharoidal spar, the other as loose doubly terminated crystals imbedded in a white evenly textured clay called halloysite (cf. Larsen and Wherry, *C. A.* 11, 1615). Color white or with purplish bands; luster vitreous; cleavage pinacoidal; fracture conchoidal; H. 4; sp. gr. 2.713; monoclinic; optically negative, $\alpha=1.461$, $\beta=1.478$, $\gamma=1.485$. The crystallography is described at length with many angular measurements. Sol. in HCl or H_2SO_4 . Analysis gave: Al 11.74, Ca 23.72, SO₄ 19.10, O 4.36, F 30.30, H_2O -0.06, H_2O + 10.72, sum 100.00%. These figures agree closely with those of Wells, giving the formula $2\text{CaF}_3 \cdot 2\text{Al}(\text{OH}, \text{F})_2 \cdot 2\text{H}_2\text{O} \cdot \text{CaSO}_4$. It stands closest to pachnolite, with 2 mols. of NaF replaced by one of CaSO₄. L. W. RIGGS

Vivianite encrusting a fossil tusk from gold placers of Clearwater Co., Idaho. EARL V. SHANNON. *Proc. U. S. Nat. Museum* 59, 415-7 (1921).—The specimen described was found in the northern part of Idaho. Its exterior is made up of vivianite crystals. The center is sandy material consisting of quartz, feldspar, hornblende, mus-

covite, chlorite and garnet imbedded in a clayey matrix. None of these mineral grains is water worn and the material is such as might result from the decompr. of a granitic rock. The crystallography of the vivianite is described; one new form is well developed.

L. W. RIGGS

Schafarzikite, a new mineral. JOSEPH A. KRENNER. Budapest. *Z. Krist.* 56, 198-200(1921); (Paper presented at meeting of Hungarian Acad. Sci. Jan. 15, 1915, and after death of author transmitted for publication by Z. von Toborffy).—Among the alteration products in the Sb mine at Pernek, Com. Pozsony, Hungary—valentinite, senarmontite, and kermesite—occur red needles resembling the last mineral. Measurements show the crystals to be tetragonal with $a:c=1:0.9787$, and as this does not agree with any previously known mineral, it is here announced as new and named after Prof. Franz Schafarzik. Although intimately associated with Sb oxides, it is not genetically related to them. Qual. tests showed it to contain Fe and P, but there was insufficient material for quant. analysis. As it is isomorphous with trippkeite, which is supposed to be a Cu arsenite, it is suggested to be a Fe phosphite, n $\text{FeO.P}_2\text{O}_5$. [The evidence for this seems inconclusive. Abstractor.]

E. T. W.

Whewellite. F. KOLBECK, V. GOLDSCHMIDT AND R. SCHRÖDER. Freiberg and Heidelberg. *Beitr. Kryst. Min.* 1, 199-217(1918).—An elaborate crystallographic discussion of this mineral, calcium oxalate monohydrate. Many new forms are described and complete angle tables for 2 orientations given.

E. T. W.

Palmierite from Vesuvius and accompanying minerals. FERRUCCIO ZAMBONINI. *Compt. rend.* 172, 1419-22(1921); cf. Lacroix, *C. A.* 1, 2225; 2, 3220.—The crystallography of palmierite from Vesuvius fumaroles is described and compared with that of aphthitalite. Palmierite is optically uniaxial, $-w_D=1.712$ (immersion method), sp. gr. 4.5. It is rapidly decompr. by H_2O . Z. prepd. palmierite artificially by the fusion for 1 hr. at 1000° of a mixt. of K_2SO_4 5 g., PbSO_4 7.5, Na_2SO_4 9.0. On gradual cooling, plates were formed, some with hexagonal outline, which were isolated by treating the cooled fused mass with a 2% soln. of K_2SO_4 . These plates were uniaxial, $-w_D=1.71$. Analysis gave: SO_3 33.62, PbO 47.48, K_2O 17.53, Na_2O 1.31, sum 99.94%, which corresponds to the formula $(\text{K},\text{Na})\text{SO}_4\text{PbSO}_4$, in this case 90% $\text{K}_2\text{Pb}(\text{SO}_4)_2$ and 10% $\text{Na}_2\text{Pb}(\text{SO}_4)_2$. Palmierite is sometimes found inclosed in white aphthitalite which is accompanied by plumbo-cuprifero aphthitalite and by ferronatrite. Hematite and jarosite have also been found with palmierite.

L. W. RIGGS

Vipont District mines and prospects. S. F. HUNTER. *Salt Lake Mining Rev.* 23, No. 7, 11-14(1921).—An account of this northwestern Utah district, giving the magnitude and permanence of the Ag deposits, and a detailed explanation of the geology.

A. H. HELLER

An unusual copper-lead deposit. W. L. UGLOW. *Mining Sci. Press* 123, 197-9 (1921).—The M. and K. prospect located near Pacific in British Columbia consists of country rock of various igneous materials intruded by quartz-porphyry dikes. An intimate mixture of bornite and galena occurs which appear to be of simultaneous development. Under high magnification the megascopically homogeneous bornite is seen to be filled with a quadrillage structure of chalcopyrite laths, which represent one of the early stages of the replacement of the bornite. An account is given of the origin of these masses of Cu and Pb sulfides.

A. H. HELLER

An occurrence of sulfidic copper ores in quartzite at Onega-sjön. PENTTI ESKOLA. *Geol. Förh.* 40, 863-71(1918).—The ores occur in quartzite near the contact with underlying greenstone agglomerate. Their geology and origin are discussed in detail. There is evidence that the bornite present is primary, but the chalcoite has been formed by its alteration.

E. T. W.

Magnetic iron ores in the basin of Longwy-Briey. L. CAVEUX. *Compt. rend.* 172,

1513-6(1921).—A study of the genesis of these rocks of partly oölitic structure showed that the Fe was introduced into the oölites between the time when they were in loose condition and that when they were definitely incorporated in the sediment.

L. W. RIGGS

Manganese deposits near Bromide, Okla. D. F. HEWITT. U. S. Geol. Survey, *Bull.* No. 725E, 311-29(1921).—Five deposits or groups of deposits are known near Bromide. In 3 of them the commonest mineral is a carbonate of Mn, Ca, and Mg. Analyses are given of 15 samples of Mn ore and 4 samples of adjacent limestone. The ores ranged from 16.28 to 73.49% MnO, averaging about 33%. The adjacent limestones contained from 0.39 to 9.08% of MnO. By careful sorting the ore at some of the deposits would yield a product contg. 40 to 45% MnO. Compared with the Ga., Va., and Mont. deposits the economic importance of these ores is small. L. W. RIGGS

Deposits of chrome ore in North Carolina. J. VOLNEY LEWIS. U. S. Geol. Survey, *Bull.* No. 725B, 101-39(1921).—The ores occur in peridotites, which form numerous isolated outcrops in a belt 5 to 25 miles wide and extending 200 miles throughout the mountainous western part of North Carolina, the best known deposits being in Jackson and Yancey counties. Chromite is variable in compn., the metals replacing each other as partly indicated by the formula $(Fe, Mg)(Cr, Al, Fe)_2O_4$. While the value generally varies with the Cr content, for the production of ferrochrome a proper ratio of Cr to Fe is most important. Analyses of 10 N. C. samples gave from 39.95 to 62.32% of Cr_2O_3 with an av. well above 50. The total production of chrome ore in N. C. to the end of 1918 is estd. at 392 tons, 116 tons of which still remains at the mines. Mining methods, mines and prospects, and the probable genesis of the ore are described.

L. W. RIGGS

Chrome ores in Pennsylvania and Maryland. ELEANORA B. KNOFF. U. S. Geol. Survey, *Bull.* No. 725B, 85-99(1921).—A historical sketch of these deposits from the first working in 1827 to the present is given. The ores are located at an av. of 30 miles northeast of Baltimore on both sides of the state line with scattered mines or prospects nearer Baltimore, and from 1828 to 1860 were practically the only sources of supply for the world. The ore occurs as: massive compact chromite in nodules and pockets in a serpentine gang; disseminated chromite, evenly distributed through the serpentine; and placer deposits. Th: Cr content ranges from 48 to 63% Cr_2O_3 . If the chromite in disseminated ore carries less than 30% of Cr_2O_3 a high-grade concentrate cannot be recovered. There appears to be an abundance of high-grade ore in this region, but its profitable production depends on the cost of working as compared with the cost in competing localities.

L. W. RIGGS

Search for molybdenum and tungsten ores in Sardinia. ALESSANDRO MARTELLI. *Rass. min.* 54, 99-102(1921).—Unimportant deposits of MoS_2 occur in Paleozoic schists and granites, while more important veins are those in Silurian and Devonian schists. Wulfenite occurs rarely. W is frequently found as $CaWO_4$ of high purity, some deposits having been worked since 1904. The outlook is good for the development of special steels.

M. R. SCHMIDT

Huge deposits of strontium ore located in Millard County, Utah. ANON. *Salt Lake Mining Rev.* 23, No. 8, 9.—An article dealing with the nature of the deposit, the properties and characteristics of Sr, and its production, use and value. A. H. H.

Graphite ore-deposits in Norberg's Bergslag. GUSTAF T. LINDROTH. *Geol. För. Förh.* 40, 27-76(1918).—The history and production of the graphite deposits are reviewed, and their geology and petrography described in detail. The graphite occurs in gneissoid granites near contacts with leptite. Two analyses are given of one-mica granite, and one each of two-mica granite, greisen, and a white mica sept. from a rock. The rock analyses are calcd. into quant. and Osann values, and projected into

a triangular diagram on the basis of the latter. The graphite is epigenetic, or later than the enclosing rocks, occurring also in veins. A striking feature of the graphite occurrences is the extensive muscovitization of the feldspars of the enclosing rocks, a hydro-thermal effect evidently connected with the introduction of the C. The graphite is probably of org. origin. E. T. W.

Baja (lower) California and oil possibilities. VICTOR H. WILHELM. *Mining. Sci. Press* 123, 125-7(1921).—A geological reconnaissance of the southern and central parts, the former consisting mainly of granitic intrusives, gneiss, and schist, bordered by a series of Tertiary and Pleistocene sedimentaries and the latter consisting of large deposits of limestone, sandstone, and volcanic tuff, with recent rhyolitic and basaltic flows. A good account is given of the topography, climate, and geology. There are very few oil seeps, and a good many of the so-called seepages result from oil liberated in the ocean and washed ashore. Sedimentary formations in lower California are lacking in anticlines or folds favorable for the accumulation of oil. A. H. HELLER

Erosion and solution. V. GOLDSCHMIDT. Heidelberg. *Beitr. Kryst. Min.* 1, 183-98(1918).—From a study of the phenomena connected with erosion of geological objects and with soln. of solids in liquids it is concluded that the mechanisms in the 2 cases are essentially identical. E. T. W.

The Salton Sea. A. E. VINSON, C. N. CATLIN AND S. W. GRIFFIN. Arizona Expt. Sta., *Ann. Rept.* 30, 412-14(1919).—A study of the changes in the chem. compn. of the Salton Sea as evapn. took place after the closing of the break in the Colorado River, in coöperation with the Desert Botanical Lab. of the Carnegie Inst. Analyses are given of the water taken for ten consecutive years. A. A. RILEY

The salinity of some Swedish ground waters. J. GUST. RICHERT. *Geol. För. Förh.* 40, 776-82(1918).—Data are given for waters from Göteborg, Alingsås, Malmö, and Ystad. The source of the salt contents is discussed. E. T. W.

New heating microscope for high temperatures with synchronous revolving nicols (ENDELL) 1. Chemico-crystallographic notes (STEINMETZ) 2. Crystal structure and the construction of the atom (NICOLI) 2. The problem of the constitution of fossil organic matter and the relation of its solubility in organic solvents at atmospheric pressure and excess pressure to its natural mode of formation (ENGLER, TAUSZ) 2. Graphic representation of the chemical composition of natural waters (DULOUX) 14. Parallelism of the soils developed on the gray drifts of Minnesota (ROST) 15.

LEITH, C. K.: *Economic Aspects of Geology*. New York: Henry Holt and Co. 431 pp. \$5.00. For review see *Eng. Mining J.* 112, 303(1921).

9—METALLURGY AND METALLOGRAPHY

D. J. DEMOREST, ROBERT S. WILLIAMS

Gold, silver, copper, lead and zinc in Arizona in 1919. V. C. HEIKES. U. S. Geol. Survey, *Mineral Resources of U. S., 1919*, Part I, 331-71(preprint No. 16, published Aug. 12, 1921). E. H.

Gold, silver, copper, lead and zinc in the Eastern States in 1920. J. P. DUNLOP. U. S. Geol. Survey, *Mineral Resources of U. S., 1920*, Part I, 7-15(preprint No. 2, published Aug. 13, 1921). E. H.

Gold, silver, copper, lead and zinc in Idaho and Washington in 1919. C. N. GERRY. U. S. Geol. Survey, *Mineral Resources of U. S., 1919*, Part I, 451-96(preprint No. 19, published Aug. 11, 1921). E. H.

Gold, silver, copper, lead and zinc in Utah in 1919. V. C. HEIKES. U. S. Geol.

Survey, *Mineral Resources of U. S., 1919*, Part I, 417-49 (preprint No. 18, published Aug. 9, 1921). E. H.

Operations of the Engels Copper Mining Company. I. A. B. PARSONS. *Mining Sci. Press* 123, 151-8 (1921).—A very detailed account of operations. The principal Cu minerals are bornite and chalcopyrite occurring in a granodiorite gang. Details of the shrinkage stopping of mining in use are given together with the underground equipment used. II. *Ibid* 183-94 (1921).—This article deals mainly with the mill, and its operation. The crushing plant is sep. and its equipment is given. The mill is practically new, includes the most modern practice and equipment and is capable of treating 1400 tons of ore per day. From a 2.21% Cu mill feed a 0.45% tailing and 29.76% concentrate are obtained. The article includes many plans, photographs and flow sheets.

A. H. HELLER

The effect of sizing a copper blast furnace charge. JULIUS H. GILLIS. *Eng. Mining J.* 112, 175 (1921).—Comparative runs on large size and small size ore in a Cu blast furnace showed a difference in costs for the entire smelter of about 20% in favor of the smaller sizes. Ore mixt. for the blast furnace should contain the proper % of voids with the greatest possible area of surfaces exposed. The voids make a loose charge and allow the free flow of gases and the large area of exposed surface makes for rapid operation of the furnace. Although the % of voids in a given vol. of close-packed pieces of uniform size is approx. the same for all sizes of pieces, there is greater surface exposed with the smaller pieces. If two sizes are mixed a definite quantity of the smaller is entirely contained in the voids of the larger size, the bulk of the mixt. remaining the same as the original bulk of the larger size. Thus the charge would be tighter. Large pieces of ore or flux in the charge do not loosen the charge or permit the use of a larger % of fines but rather the contrary. The mixing of various sizes of ore before charging is effort in the wrong direction. A more open charge might result if the ore were screened and the different sizes charged in layers or batches.

LOUIS JORDAN

Recovery of zinc in the Martin oven as zinc oxide. R. W. MÜLLER. *Feuerungs-technik* 9, 85-8 (1921).—Technical description of a patented process for the recovery of Zn from various forms of Zn-coated Fe as ZnO, analyzing 96.6% ZnO, 2.1% PbO, 1.28% Fe₂O₃ and 0.23% MnO and SO₃. C. J. WEST

The Bessemer process for making steel. ARTHUR P. R. WADLUND. *Trans. Am. Soc. Steel Treat.* 1, 682-9 (1921).—A comparison of the basic and acid processes.

W. A. MUDGE

Metal spraying processes. NIKOLAUS MEURER. *Elektrochem. Z.* 27, 101, 114 (1921).—Detailed review profusely illustrated.

C. G. F.

Standardizing specifications for tool steel. CHARLES M. BROWN. *Trans. Am. Soc. Steel Treat.* 1, 666-72 (1921).—The following classification is proposed: (1) High speed steel, (2) a W alloy finishing steel, (3) a Mn alloy oil hardening steel, (4) a Cr alloy tool steel, (5) a V alloy tool steel, (6) a Mo alloy tool steel, (7) steels contg. 2 or more alloys, such as Cr-V, Cr-W, etc. and (8) C tool steels.

W. A. MUDGE

Relations between the physical properties of steels and their endurance of service stresses. JAMES E. HOWARD. *Trans. Am. Soc. Steel Treat.* 1, 673-82 (1921).—A general review and discussion with special emphasis on heat treatment. W. A. M.

An introduction to the study of crystalline deformation. ALBERT PORTEVIN. *Rev. metall.* 18, 290-9 (1921).—An introductory paper from Osmond's unpublished notes giving a general review of the field with special emphasis on Mugge's work [C. A. 9, 281; 10, 707, 737]. The different forms produced by deformation and their relation to the original network are illustrated by diagrams. The application of these principles to the deformation of metals in com. work is briefly discussed. W. A. M.

The effect of welding on the resistivity of steel. EUGENE L. DURUY. *Compt. rend.* 172, 1660-2(1921).—Small differences in the amt. of iron oxide in welded steel will cause large variations in the relation of elec. resistance to decrease in cross section on cold working. This is similar to LeChatelier's experiences with Cu_2O in Cu. The oxidation is difficult to overcome, especially with low-C steels. W. A. MUDGE

Carburizing temperatures best suited for steels of various carbon contents. C. A. HAUX. *Trans. Am. Soc. Steel Treat.* 1, 688-9(1921).—H. has found the following temps. most suitable for C steel: 0.05-0.15% C steel, 1700° F.; 0.15-0.25% C steel, 1675° F.; 0.20-0.30% C steel, 1660° F.; 0.30-0.40% C steel, 1650° F.; 0.40-0.50% C steel, 1640° F. W. A. MUDGE

Carbonizing and carbonizing materials. H. B. KNOWLTON. *Trans. Am. Soc. Steel Treat.* 1, 689-98(1921).—Variations in results are often due to non-uniformity of the carburizer as well as poor temp. control. Charcoal, bone, leather, coal, and chem. preps. are discussed. The chemical should always be an integral part of the carbonizing compd. W. A. MUDGE

The determination of the coefficient of normal viscosity of metals. KOTARO HONDA AND SEIhei KONNO. *Phil. Mag.* 42, 115-23(1921).—A torsional method was used to measure the normal viscosity of 12 different metals at room temp.; their values range from 0.7 to 27×10^3 . The coeff. of viscosity of a metal of low m. p. is large. The coeff. of normal viscosity is of the same order of magnitude as that of tangential viscosity. In C steels the viscosity increases with the C content. S. C. LIND

High resistance brass. PENDLETON POWELL. *Brass World* 17, 151-3(1921); [Original in *Bull. tech. des arts et metiers*.]—Great care must be taken in the melting of brasses for high resistance to rupture, such as will fulfil specifications, like the French marine's. These demand 18% elongation, 16 kg. and 35 kg. per sq. mm. resp. for elastic limit and tensile strength. The alloys are chiefly the Romat, Delta, Parsons, Stone, Secretan, etc. Moisson found that the physical characteristics improve as the pouring temp. approaches the m. p., and as the speed of cooling is increased. Also the tensile strength increases with Zn percentage up to 45%, and then decreases rapidly; elongation increases with Zn up to about 30%, and then decreases less rapidly. Thus the optimum mixt. is 30-45% Zn, with small amts. of Al or Mn, etc., and the balance Cu. On account of the readiness of the metal to oxidize, extra attention should be given to: (1) provide numerous vents in molding; (2) pour from bottom of ladle through aperture left by raised plug (quenouille ladle); (3) use underfeed gate, especially for large castings; and (4) use only scrap rejuvenated by added Zn. F. H. HOTCHKISS

Notes on the so-called action of water on lead. JOHN C. THRESH. *Analyst* 46, 270-9(1921).—The expts. described show that H_2O has no action on Pb; it is the foreign material dissolved in the H_2O which affects Pb, O combining with it to form a sol. oxide or hydroxide which remains in soln. (to point of satn.) in the absence of other substances capable of combining with it. The soln. is of a colloidal nature and is either of such a coarse degree of dispersion or so liable to adsorption that it fails to pass through a Pasteur filter and may not pass through even a fine filter paper. In the presence of acids forming sol. Pb salts, such salts are formed and these pass through any filter. If the acid forms insol. salts, these are pptd. and may be deposited on the metal in such a way as to prevent further action. Sol. salts present in the water may act upon the lead hydroxide. M. C. PERRY

The effect of hardening on the critical points. LEON GUILLET AND MARCEL BALLAY. *Compt. rend.* 172, 1576-8(1921).—The difference in elec. resistance between hardened and annealed material was plotted as a function of the temp. This gives for several alloys, especially the 60:40 and 67:33 brasses, a method superior to the dilatometric scheme for detg. defects due to improper forging conditions, and also offers an inter-

esting method for studying the precise effects of the different factors in the forging operations.

W. A. MUDGE

Thermal, electrical and magnetic properties of alloys. ALPHUS W. SMITH. Ohio State Univ. *J. Franklin Inst.* 192, 69-105(1921).—The physical quantities and units are defined. An account is given of (1) metals insol. in each other (Pb-Sn, Sn-Zn, Bi-Cd, Cd-Sn, Cd-Zn, Al-Sn, Al-Bi); (2) metals completely sol. in each other (In-Pb, Pd-Ag, Pd-Au, Pd-Pt, Au-Ag, Cu-Au, K-Rb, Pt-Ir, Cu-Ni, Fe-Ni, Mg-Cd); and (3) metals with limited solv. in each other (Al-Zn, Cu-Ag, Bi-Pb, Sb-Sn, Pb-Tl, Pb-Sb, Cu-Co, Bi-Sb). *Ibid* 157-202. The section on metals with limited solv. in each other is concluded with an account of Bi-Sn, Cu-Zn, Cu-Sn, Ag-Sn, Ag-Bi, Pb-Cd, and Pb-Ag. Metals forming compds. with each other are then discussed: Te-Sn, Bi-Te, Bi-Mg, Mg-Sn, Mg-Zn, Bi-Tl, Al-Mg, Cu-As, Pb-Mg, Mg-Cu, Sb-Te, Sb-Al, Sb-Mn, Sb-Zn, Sb-Cd, Mg-Ag, Ag-Sb, Al-Cu, Al-Ag, Al-Ni, Ni-Sn, Fe-V, Cu-Sb. Sections are also devoted to the change of e. m. f. with temp., theories of resistance and e. m. f., and resistance and hardness. A bibliography of 177 references is given. JOSEPH S. HEPBURN

Thermal analysis of binary and ternary alloys. J. WÜRSCHMIDT. Erlangen. *Z. Physik* 5, 39-53(1921).—For measuring cooling curves W. employs an Fe-constant thermo-element and galvanometer. In order to increase the sensitivity and range of the galvanometer the thermal e. m. f. was opposed by a variable e. m. f. from a storage battery and the current corresponding to the difference recorded. The complete diagram is given for Bi-Sn. The eutectic has a compn. of 46 at. % of Bi and a m. p. of 140°. Curves are also given for several series of Bi-Sn-Pb. A eutectic melts at 96° and has the compn. Bi₂SnPb. F. C. HOYT

Baths and vats for hot galvanizing. PIERRE BREUIL. *Bull. officiel direction recherches sci. ind. inventions* 1921, No. 16, 116-26.—Great care must be taken in construction of baths and vats. Castings are best for small units; O-H weldings are superior to riveting for large units since the latter cause accelerated corrosion. Defects in welds will also cause local corrosion. Fe-Si alloys are especially resistant. The temp. of the bath has the greatest effect upon corrosion. At 490° the loss in wt. of Fe in molten Zn is 20-30 g. per sq. m. per hr. At 500° the loss is 9 times as great, and at 530° it is 30 times as great. The temp. of the bath should not exceed 450° at which the corrosion of Fe by Zn is the least. The Zn used contains 0.06-2.55% Pb, 0.01-0.28% Fe, 0.017-0.09% Cd, and 0.02-0.07% Sn. Addition of 0.25% Al as 5-10% Al-Zn alloy increases the fluidity of the bath, gives most regular and closely adherent coatings, and decomposes some of the Fe-Zn mats formed during the process. A small amt. of Pb will reduce corrosion to some extent and therefore prevent the formation of too much mat. 68% of the Zn used in a galvanizing bath is deposited on the iron; 2% is lost by volatilization; 18% forms mats contg. 91% of Zn; and 12% forms an ash, contg. 66-68% Zn. These last two come to the surface, are skimmed off, and the Zn is recovered. The Fe-Zn binary alloys are discussed briefly. The investigation will be continued. W. A. M.

Artistic metal etching and inlaying (called tausia). E. WERNER. *Elektrochem. Z.* 27, ii, 61, 68(1921).—Detailed directions based on modern practice. C. G. F.

The Draeger autogenous welding and cutting torch. ANON. *Elektrochem. Z.* 27, ii, 64-5(1921); 2 illus.—Details in the operation of the torch are given. Both O-C₂H₂ and O-H are used. C. G. F.

Aluminium covering for grating. J. A. JONAS. *Mælk. Tid.* 27, 379-81(1921).—In expts. upon grate bars in locomotives the Al-covered bars lasted 4 times as long as the unprotected bars. The thickness of the covering was about 0.1 mm.

blowing engine (AUGUSTIN) 24. Powdered fuel (BIBBY, *et al.*) 21. The relation between the anomaly of dilatation and the thermal variation of magnetism in ferromagnetic alloys (CHEVENARD) 2. Magnetic properties of compressed powdered iron (SPEED, ELMEN) 4. X-ray examination of materials (CLARKE) 3. Treatment of waste waters from metallurgical plants (DELKESKAMP) 14. Electric heating furnaces in steel works (GUILLERMAN, GILLOT) 4.

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AUSTIN, LEONARD S.: *The Metallurgy of the Common Metals*. 5th Ed. Revised and enlarged. New York: John Wiley and Sons. 615 pp. \$7.00 net.

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BREARLEY, HARRY: *The Case-hardening of Steel*. 2nd Ed. New York: Longmans, Green. 207 pp. \$6.

BUCHANAN, JOHN FINDLAY: *Practical Alloying*. Cleveland, O. Penton Pub. Co. 205 pp. \$5.

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RUMBOLD, W.: *Chromium Ore*. London. J. Murray.

TAMMANN, G.: *Lehrbuch der Metallographie*. Leipzig: Leopold Voss. 402 pp. M 41.05.

VAN DYKE, G.: *Shop Handbook on Alloy Steels*. Chicago and St. Louis: J. T. Ryerson and Son.

Apparatus for concentrating ores by flotation. J. HEBBARD. U. S. 1,380,650, June 7.

Ore-flotation apparatus. F. J. LYSTER. U. S. 1,380,665, June 7.

Ferrosilicon. J. T. JONES. U. S. 1,379,022, May 24. In the production of ferro-Si, the Fe-Si ore is crushed to a fineness of 20-100 mesh, mixed with an excess of bituminous coal crushed to the same fineness and the mixt. is heated out of contact with air to coke the coal and reduce the metal. Subsequently the coke is burned out and the metal is melted into the alloy.

Reducing ores. J. T. JONES. U. S. 1,379,023, May 24. Ores such as low grade Fe, Mn or Al ores are mixed with an excess of crushed coal, both the ore and coal having a fineness of 20-100 mesh, and the mixt. is heated out of contact with air sufficiently to coke the coal and produce an agglomerated mass resembling coke. The metals are sep'd. from this mass by burning out the C.

Reducing iron ores. J. T. JONES. U. S. 1,379,024, May 24. Fe ore, mixed with coal, without addition of flux, is heated out of contact with air to coke the coal and reduce the Fe to metal, the mass is crushed and the Fe is sep'd. magnetically.

Metallic magnesium. L. WALBO. U. S. 1,379,886, May 31. MgO is mixed in finely divided condition with finely subdivided Al, the mixt. is closely compacted under pressure and is then heated *in vacuo* to 1100-1350° to effect reduction and distn. of Mg.

Conveyor furnace for treating ores with hot gases. G. H. CLEVENGER. U. S. 1,379,083, May 24. The furnace is especially adapted for treating oxide ores of Mn.

Ore-roasting furnace. H. A. CLARK, J. F. HILL, and A. G. McGREGOR. U. S. 1,380,529, June 7.

Steel. A. H. HENDERSON. U. S. 1,378,861, May 24. In the production of steel for molding into ingots or castings, 4 lbs. of anhydrous borax is added to each ton of metal during the fusing, in order to cleanse and refine the metal and prevent blow-holes.

Wrought iron. J. ASTON. U. S. 1,380,178, May 31. See Can. 210,718 (*C. A.* 15, 1690).

Protecting iron or steel from corrosion. F. L. SORENSEN. U. S. 1,380,847, June 7. A mixt. formed from ZnO, Zn and NaOH soln. in paste form is frictionally applied to the surface of Fe or steel articles to form a coating which will protect the article from rust.

Heat-treating steel. W. C. PETERSON. U. S. 1,380,678, June 7. Steel articles, *e. g.*, car wheels or gears, are heated to a temp. above the critical point of the metal and then quenched; the temp. and rate of heating are so regulated that the article after quenching assumes the same dimensions as it had previous to the heating.

Detinning tinned iron scrap. M. A. ADAM, J. STEVENSON and A. T. MABBITT. U. S., 1,379,237, May 24. See Brit. 154,242 (*C. A.* 15, 991).

Coating ferrous metals with lead. J. H. MADDY. U. S. 1,379,998, May 31. A continuous adhering coating of Pb on Fe or steel, when applied by means of a molten bath, is insured by preliminarily coating the metal with an electrolytic deposit of Hg.

Coating other metals with aluminium. C. DANTSZEN. U. S. 1,381,085, June 7. Articles formed of Fe or Cu are coated to protect them against rusting by first cleaning the metal and giving it a coating of Sn or Zn, dipping it in molten Al or Al-Sn alloy and heating it to a temp. of about 800°.

Magnesium-aluminium alloy for phonograph reproducer diaphragms. L. C. PERRITT. U. S. 1,380,498, June 7. Phonograph reproducer diaphragms are formed of a malleable, springy and fine grained alloy which may contain Mg 5 and Al 100 parts.

Alloy for withstanding high temperatures. F. A. FAHRENWALD. U. S. 1,378,941, May 24. An alloy adapted for use in retorts, rabbet-arms or other app. subjected to high temps. is formed of Fe combined with Cr 10-20%, Si 2-6% and smaller amts. of C, Al, Ti and Mn.

Platinum alloy. F. E. CARTER. U. S. 1,378,906, May 24. An alloy adapted for making hypodermic needles or elec. contact points is formed of Pt combined with Pd 0.5-5% and Au 5-15%. Cf. *C. A.* 14, 230.

Ferro-silicon carbonizing boxes and similar articles. W. E. JEANNOT. U. S. 1,380,804, June 7. A ferrous alloy contg. Si 1-6% together with C and Mn is used for the manuf. of carbonizing boxes, annealing pots and similar articles which resist oxidation and do not change their shape when heated.

Case-hardening metals. C. A. STEWART. U. S. 1,379,319, May 24. A case-hardening material is prepd. by immersing charcoal granules in a less quantity of an aq. soln. of Na₂CO₃ or NaHCO₃ than the charcoal is capable of absorbing, mixing the materials and allowing them to stand to effect uniform impregnation and then heating to expel the moisture.

Composition for case-hardening. D. E. RICHARDSON. U. S. 1,379,722, May 31. A case-hardening mixt. is formed of diatomaceous earth or tufa 65, NaCl 15, KNO₃ 20 and Na K tartrate 0.6 part.

Molds for metal castings. V. LOUGHED. U. S. 1,380,398, June 7. A mixt. of CaSO₄ 80 and kieselguhr 20 parts by wt. is used for making molds for dental inlays or other small castings.

10—ORGANIC CHEMISTRY

C. A. ROUILLET

Recent advances in science—Organic chemistry. O. L. BRADY. Univ. London. *Science Progress* 16, 14–20 (1921).—The present status of *Baeyer's strain theory* is discussed; and a résumé is given of recent work on the *constitution of pinacyanol* and on the synthesis of the *ephedrines*. JOSEPH S. HEPBURN

Ernst Schmidt. J. GADAMER. *Chem.-Ztg.* 45, 729–30 (1920).—An obituary. E. H.

The commercial synthesis of certain organic compounds derived from acetylene. ANON. *Schweiz. Chem. Ztg.* 1921, 291–6.—A general discussion of the technically important condensation and addition products derived from C_2H_2 , such as paraldehyde, aldo, $EtOH$, $AcH-NH_3$, Ac_2O , acetylene black, and ethylene chlorides. T. S. CARSWELL

Pyrogenic decomposition of the metallic alcohohates and phenates. J. F. DURAND. *Compt. rend.* 172, 1504–6 (1921).— $NaOMe$ decomp. just above 300° almost quant. according to the equation $6MeONa \rightarrow 9H_2 + Na_2C_2 + 2Na_2CO_3 + 2C$. $KOMe$ decomp. slightly differently, giving K instead of K_2C_2 . $Ba(OMe)_2$ decomp. about 350° as follows: $2Ba(OMe)_2 \rightarrow 6H_2 + BaO + BaCO_3 + 3C$. $NaOEt$ decomp. according to the equations $2NaOEt \rightarrow 2C_2H_4 + 2NaOH$; $2NaOEt \rightarrow 4H_2 + 2NaOH + 4C$. $NaOPh$ decomp. as follows: $NaOPh \rightarrow 2H_2 + NaOH + 6C$. O. B. H.

Syntheses of tertiary alcohols starting from methyl ethyl ketone. PARISELLE AND SIMON. *Compt. rend.* 173, 86–9 (1921).—With $MeEtCO$ (A) as starting point, several alcs. were synthesized by new methods. Some of the constns. were found to be different from those in previous literature. 3-Methyl-3-pentanol (B), from A and $MgBrEt$, b. 121° , $d_0 0.8452$, $n_D^{21} 1.418$; yield 65%. 3-Methyl-3-pentene (C), from B and $ZnCl_2$, b. 69° , $d_0 0.7158$, $n_D^{20} 1.402$; yield quant. 3-Methyl-3,4-dibromopentane (D), from C and Br in CCl_4 , b₁₅ 82° , $d_0 0.7158$, $n_D^{20} 1.507$. 3,4-Dimethyl-3-pentanol (E), not isolated before (cf. *Ann.* 13, 89; 188, 124; *Bull. soc. chim.* 29, 530 (1878)), from A and $MgBrCHMe_2$, b₁₅ 136° , b₁₅ 50° , $d_0 0.8586$, $d_0 0.8415$, $n_D^{20} 1.427$. 2,3-Dimethyl-2-pentene, from E and $ZnCl_2$, b. $90-2^\circ$, $d_2 0.72$, $n_D^{22} 1.413$. 5-Methyl-4-hepten-3-one, formed as secondary product in the formation of E by the dehydrating action of $MgBrCHMe_2$ on A (cf. Bodroux and Taboury, *C. A.* 4, 1037), b. $163-4^\circ$, $d_0 0.869$, $n_D^{22} 1.4428$. C. C. DAVIS

The preparation of guanidine salts and of nitroguanidine. THOMAS EWAN AND JOHN H. YOUNG. Cassel Cyanide Co., Glasgow. *J. Soc. Chem. Ind.* 40, 109–12T (1921).—Guanidine (A) has been prep'd. from cyanamide (B) by Erlenmeyer (*Ann.* 146, 253 (1868)) and Volhard (*J. prakt. Chem.* [2] 9, 15 (1874)). E. and Y. obtained guanidine nitrate (C) in a yield of 43.1% by dissolving 5 g. of 72.8% Na_2CN_2 in 200 cc. H_2O with the addition of sufficient HNO_3 to make the soln. just acid, evapn. to a small bulk, and heating for 0.5 hr. at 155° with the addition of 6 g. NH_4NO_3 . Vozarik's method of pptn. as picrate (*Z. angew. Chem.* 15, 670 (1902)) was employed to det. A quant. The prepn. may be divided into stages: (1) soln. of the Na_2CN_2 in dil. HNO_3 ; (2) evapn. of this soln. to dryness under reduced pressure; (3) extn. of B from the residue with Et_2O ; (4) evapn. of the Et_2O soln.; (5) heating the residue at $150-80^\circ$ to form C. The yield in stages 1–4 was quant.; the loss took place in stage 5. B was then polymerized to di-cyanodiamide (D) at the end of stage 4 by the addition of a little NH_4OH ; stage 5 then gave an almost quant. conversion of D into C. Rathke (*Ber.* 18, 3102 (1885)) found that D with NH_4Cl gave *guanidine hydrochloride*, together with *biguanide*, $NH_3C(:NH)-NHC(:NH)NH_2$, and *melanurenic acid*, $NH_3C(:NH)NH.CO.NH.CO$. Smolka and Frie-

dreich (*Monatsh.* 9, 1227 (1888); 10, 86 (1889)) obtained biguanide by the interaction of

D and NH_4Cl . Bamberger and Dieckmann (*Ber.* 25, 543(1892)) investigated the conditions under which biguanide was formed by this method. The formation of a guanidine salt was entirely overlooked by the above investigators. *Guanidine nitrate* was prep'd. by E. and W. with 90-5% yield by fusing 300 g. D with 576 g. NH_4Cl , heating to 150° until the reaction was nearly complete, raising to 190° to complete the reaction, and pouring out into Fe molds. *Guanidine thiocyanate* was prep'd. in a similar way with a yield of over 90% by heating 55 parts D with 100 parts NH_4SCN . The same results were obtained by Werner and Bell (*C. A.* 15, 371). *Guanidine sulfate* in 83% yield was prep'd. by intimately mixing 100 parts dry $(\text{NH}_4)_2\text{SO}_4$ with 60-62 parts D and heating to 150 - 80° ; as by-products were obtained 5.67% of ammelin, 1.16% of biguanide sulfate, and a trace of melamine. *Guanidine hydrochloride* was made in a similar way to the sulfate. *Nitroguanidine*, $\text{C}_4\text{H}_4\text{NO}_2$ (F), was prep'd.: (a) By dissolving 5 g. C in 5 cc. concd. H_2SO_4 , dilg. the acid to 20% with H_2O and filtering off F; 92% acid gives the best yield; when 5 g. C and 5 cc. of 92% H_2SO_4 are used a 48-hr. reaction period increases the yield to 83.1%; when 10 cc. acid are used the yield is 78-9%, and the temp. of reaction has little effect on the yield; (b) by nitrating 5 g. C with 15 cc. of 87.6% HNO_3 for 96 hrs. a 64.5% yield was obtained; (c) by nitrating 5 g. C for 68 hrs. with 13.6 g. of mixed acid containing 38.3% HNO_3 and 60.9% H_2SO_4 a 76% yield was obtained (cf. Thiele, *Ann.* 270, 1(1892)). Tables are given showing the solv. of F in 6 to 33% H_2SO_4 and in 6 to 27% HNO_3 .

T. S. CARSWELL

Synthesis of cyanic acid and urea by oxidation of ketones, acids and amines in the presence of ammonia. R. FOSSE and G. LAUDE. *Compt. rend.* 172, 1240-2(1921).—HCNO is the const. product of the ammoniacal oxidation of proteins, acid amides, HO derivs. of C, glycerol, HCHO, HCONH_2 and oxamic acid and is also formed when numerous representatives of the alc., phenol and aldehyde classes are oxidized in the presence of NH. (Cf. *C. A.* 15, 1884 and earlier papers.) Urea is similarly produced by *ketones* (Me_3CO , PhCOMe , cyclohexanone), *monobasic acids* (AcOH , EtCO_2H , BuCO_2H and $\text{PhCH}(\text{CHCO}_2\text{H})$), *dibasic acids*, (malonic and succinic), *hydroxy acids*, (glycolic, lactic and tartaric), *phenolic acids* (*o*- and *p*- $\text{HOC}_6\text{H}_4\text{CO}_2\text{H}$), and *amines* (MeNH_2 , Me_2NH , EtNH_2 , PhNH_2 and *m*- $\text{C}_6\text{H}_4(\text{NH}_2)_2$). The nature of the substance and the exptl. conditions exercise considerable influence on the yields of carbimide and carbamide. After tautomerization of the NH_2CNO , the quantity of urea formed is found to be very small (0.3% max.) for monobasic acids but rises to 2-14%, 11.57-19.9% and 4-47%, resp., for the ketones, phenolic acids and amines. While EtNH_2 gives but 4.6% urea, PhNH_2 produces 15.5% and *m*- $\text{C}_6\text{H}_4(\text{NH}_2)_2$ 27.4%. The yields are further increased in the case of amines capable of forming HCHO by oxidation; thus, MeNH_2 gives 44.51% and Me_2NH 47.9%. The introduction of Cu as oxidizing medium favors, in certain instances, the formation of HCNO and urea. The hypothesis that the HCNO, rather than being the precursor of the urea, is derived therefrom through the action of KOH liberated by the KMnO_4 is disproved. A. T. FRASCATI

The influence of ammonium molybdate on the optical rotatory power of certain sugar solutions. GEORGES TANRET. *Compt. rend.* 172, 1363-5(1921).— NH_4 molybdate soln. was added in slowly increasing quantities to a cold sugar soln. The work was done at 12° and with c. p. molybdate. The change in optical rotatory power on addition of the molybdate is assumed to be the result of the formation of org. Mo compds. Also in *Bull. soc. chim.* 29, 670-8(1921).

H. W. POST

The influence of ammonium molybdate on the optical rotation of mannitol. GEORGES TANRET. *Compt. rend.* 172, 1500-3(1921).—T. has isolated the organo-molybdate responsible for the changes in the rotatory power of mannitol soln., $[\alpha]_D = 0.25^\circ$, when NH_4 acid molybdate is added. This complex is acid to indicators and is rapidly decompd. by alkalies and gradually by acids, $[\alpha]_D + 52.5^\circ$. Its compn. as detd. by analy-

sis is $[(13\text{MoO}_8 \cdot 7\text{NH}_3 \cdot 7\text{C}_6\text{H}_5\text{O}_6) \cdot 6\text{H}_2\text{O}] + 3\text{H}_2\text{O}$. It is sol. in 36 parts H_2O at 0° and in 3.5 parts at 100° . Its gradual decompr. in acid soln. is responsible for the gradual drop in rotatory power when excess NH_4 acid molybdate is added. The results obtained with mannitol are naturally capable of generalization. Also in *Bull. soc. chim.* **29**, 678-83(1921).

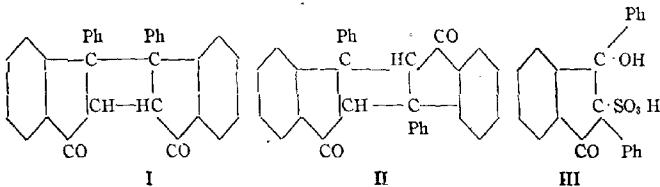
O. B. H.

Action of ethyl chlorocarbonate on tertiary cyclic amines (alkaloids). J. GADAMER AND F. KNOCH. *Arch. Pharm.* **259**, 135-58(1921).—The procedure followed in most of the expts. consisted in shaking the alkaloid (1 mol.) in Et_2O or CHCl_3 with ClCO_2Et (4 mols.) in the presence of KOH (7 mols.). On completion of the reaction, the basic and nonbasic portions are sepd. by shaking with dil. aq. acid, and finally isolated from the solvents in the usual way. In studying the behavior of bulbocapnine toward ClCO_2Et and with a view of protecting the OH group it developed that the CO_2Et group unites with the N, not with the O of the OH group as expected. This result is quite similar to that obtained by v. Braun in the case of the action of BrCN on a tetrahydroisoquinoline deriv. The *monocarboxybulbocapnine*, $\text{C}_{19}\text{H}_{18}\text{NO}_2\text{CO}_2\text{Et}$, obtained crystals. in fine needles, m. 152-3°, its solns. possessing a peculiar deep blue fluorescence. It is optically inactive and incapable of forming salts. A *dicarboxybulbocapnine*, $\text{C}_{19}\text{H}_{17}\text{NO}_4(\text{CO}_2\text{Et})_2$, resulting at the same time, optically inactive crystals, m. 137-8°. Attempts to split off the CO_2Et group with acid or alkali, as also to prep. the corresponding carbamine deriv., were unsuccessful. Bulbocapnine Me ether yields with ClCO_2Et *carboxybulbocapnine methyl ether*, $\text{C}_{21}\text{H}_{20}\text{NO}_2\text{CO}_2\text{Et}$, faintly red crystals, m. 95-6°, showing blue fluorescence in soln. Corydine yields the *carboxy compound*, $\text{C}_{19}\text{H}_{18}\text{NO}_4\text{CO}_2\text{Et}$, optically inactive, nonbasic, m. 117-8°. Both *dl*- and *l*-laudanosine yield the same product, *carboxy laudanosine*, $\text{C}_{21}\text{H}_{20}\text{NO}_2\text{CO}_2\text{Et}$, crystals, m. 157°, forms a blue fluorescent soln. Morphine gives a monocarboxy deriv., identical with the ester obtained by Otto (cf. *Arch. Pharm.* **229**, 618), and an indifferent compound, $\text{C}_{19}\text{H}_{18}\text{NO}_4(\text{COEt})_3$, while codeine yields a carboxy deriv. in the form of the *bitartrate*, $(\text{C}_{19}\text{H}_{17}\text{NO}_3 \cdot \text{CO}_2\text{Et})\text{C}_6\text{H}_4\text{O}_6$, fine needles, m. 120° (137-40° after standing some time in the air); the free base m. 77-8°. With chelidone, the monosubstituted derivative, $\text{C}_{21}\text{H}_{18}\text{NO}_4\text{CO}_2\text{Et}$, m. 97-8°; with *O*-benzoylchelidone, the same product but m. 1° lower. Exactly similar results were obtained with *O*-acetylchelidone, thus showing elimination of the Bz or Ac group through the action of ClCO_2Et on the bases. Expts. with *N*-phenylpiperidine, tropine, pyridine, papaverine, thebaine, and heroine gave more or less negative results. In general, the conclusion is drawn that, while the action of ClCO_2Et on tertiary cyclic amines approaches that of BrCN , its sphere of activity is less extensive than that of the latter. With respect to tetrahydroisoquinoline derivs., ClCO_2Et may be regarded as a group reagent, and can perhaps as such find application in throwing light on questions of constitution.

W. O. E.

A color reaction of the indones. REMO DE FAZI. Univ. Coll. London. *Gazz. chim. ital.* **I**, 51, 164-9(1921).—When de F. obtained α, β -diphenylindone (*C. A.* **9**, 3063) by the action of P_2O_5 on $\text{Ph}_2\text{CHCPh(OH)CO}_2\text{H}$ he observed that it gives a beautiful emerald-green color with concd. H_2SO_4 . Other indones. obtained by de F. (*C. A.* **10**, 1348; **11**, 1140; **14**, 3053) show the same reaction. In this paper de F. undertook to det. the reason for this reaction. When $\text{Ph}_2\text{CHCMe}(\text{OH})\text{CO}_2\text{Et}$ (**A**) reacts at room temp. with concd. H_2SO_4 it gives the emerald-green color and dissolves. If this soln. is poured on ice and cooled the color becomes orange-yellow and ppts. α -methyl- β -phenylindone (**B**) as orange-yellow flocks. When **B** is dissolved in concd. H_2SO_4 it gives an emerald-green soln. which on diln. again seps. **B**. The same behavior is characteristic of other indones. named. **A** by the action of P_2O_5 is first converted into $\text{Ph}_2\text{C}(\text{CMeCO}_2\text{Et})_2$, which on sapon. gives the free acid. The latter when reduced with $\text{Zn} + \text{HCl}$ gives $\text{Ph}_2\text{CHCHMeCO}_2\text{H}$. This acid gives no color with concd. H_2SO_4 .

Other esters and acids of the same type behave similarly. No color with derivs. of $\text{PhCH}_2\text{CH}_2\text{CO}_2\text{H}$ or hydrindones is known. β -Phenylhydrindone and α -phenylhydrindone were tested but do not give any color. allo- $\text{PhCH}(\text{CMeCO}_2\text{H})$ (C) with concd. H_2SO_4 gives a bluish green color and may be converted into α -methylindone (D) (Stoermer, Voht, *C. A.* 9, 1757). C in EtOH exposed to ultraviolet rays is converted into the stable form, which gives neither the color nor D. allo- $\text{PhCH}(\text{C}_6\text{H}_4\text{CO}_2\text{H})$ behaves similarly. The above facts show that the color is due to the formation of the indones but it was not known whether the group $-\text{CO.C: C}-$ is necessary or whether the group $-\text{CH}_2\text{C: C=}$ of indenes is also sufficient. α, β -Diphenylindene prep'd. according to Thiele and Ruggli (*Ann.* 393, 68, 77 (1903)) gives the emerald-green color in concd. H_2SO_4 . Indene also gives violet-red colors with concd. H_2SO_4 . These tests indicate that probably indenes give the same reaction with H_2SO_4 as the indones. This color reaction has led to the synthesis of β -phenylindone (E). β -Diphenyllactic acid or its Et ester gives the emerald colors with concd. H_2SO_4 and when poured on ice seps. E as an orange ppt. together with two diphenyltruxones I and II, which de F. has sepd. D gives the emerald-green color with H_2SO_4 while



II gives no color reaction. The colored compds. of indones with H_2SO_4 were not sepd. but it is considered that H_2SO_4 is united as indicated in III. It is concluded that the color reaction of cinnamic acid derivs. with H_2SO_4 is due to the formation of indones which are capable of adding H_2SO_4 to the group $-\text{CO.C: C}-$ and that the reaction is a valuable test for stable cinnamic acids.

E. J. WITZEMANN

Alkylated and acylated barbituric acids. HEINRICH BILTZ AND HERBERT WITTEK. *Ber.* 54B, 1025-58 (1921).—Barbituric acid, m. 245°, is obtained in 7-8 g. yield from 6 g. urea and 12 g. $\text{CH}_2(\text{CO}_2\text{H})_2$ (A) in 25 cc. AcOH at 60-70° treated with frequent shaking in the course of 0.5 hr. with 25 cc. Ac_2O , slowly heated in the course of 3 hrs. to 90° and kept 3 hrs. longer at 90°; in working with larger quantities it is advisable to use somewhat less Ac_2O , thus 18 g. urea, 36 g. A and 75 cc. AcOH are treated first with only 30 cc. Ac_2O , then after 1 hr. with 15 cc. more and finally 1 hr. later with another 15 cc. 1-Methylbarbituric acid, m. 132°, is similarly obtained in 6.6 g. yield from 5 g. MeNHCONH_2 , 8 g. A, 12 cc. AcOH and 25 cc. Ac_2O , the 1,3-Me₂ acid, m. 123°, in 6.5 g. yield from 5 g. $\text{CO}(\text{NHMe})_2$, and 1-ethylbarbituric acid (B) in 70% yield from 10 g. EtNHCONH_2 and 12.5 g. A at 70-80° treated in the course of 0.5 hr. with 25 cc. Ac_2O , slowly heated up to 90° in the course of 8 hrs., treated with 5 cc. H_2O to decomp. unchanged Ac_2O , evapd. *in vacuo* on the H_2O bath, taken up in 20 cc. hot alc. and cooled in ice (yield, 10-10.5 g.); the mother liquors, evapd. on the H_2O bath and heated 4.5 hrs. with 10 cc. AcOH and 10 cc. Ac_2O at 80°, yield another 1.6 g.; it seps. from 3.5 parts alc. in rectangular leaflets, m. 119-20°. 1,3-Et₂ acid, obtained in 80% yield, b_{10} 167°, m. 52°. Trimethylbarbituric acid (0.7 g. from 1 g. barbituric acid allowed to stand with CH_3N_2 in Et_2O until there was no further decolorization, evapd., rubbed up and again treated with CH_3N_2), long needles from CHCl_3 -petr. ether, m. 165°, also obtained similarly from the 1-Me and 1,3-Me₂ acids. 1-Ethylbarbituric acid (5.8 g. from 5 g. B in 10 cc. H_2O treated with vigorous shaking with 4.6 g. KNO_2 in small portions, warmed

a short time on the H_2O bath, treated with a few drops concd. H_2SO_4 to decomp. the deep violet-red K salt which seps. and boiled a short time until a bright soln. results), seps. from 5 parts H_2O with 1 mol. solvent, decomp. 183°; 2 g. boiled 0.5 hr. with 2 g. urea in 10 cc. H_2O yields 2.4 g. of the urea, $C_4H_7O_3N_3CH_2ON_2$, fine needles from 2.5 parts alc., decomp. 148°. *1-Ethyl-5,5-dichlorobarbituric acid* (4.2 g. from 3 g. **B** in 20 cc. H_2O at 50° treated 10 min. with a rapid stream of Cl), prisms with 1 H_2O from $EtOH \cdot H_2O$ (1:4), sinters 138°, m. turbid 140°, clear 143°. *5,5-Dibromo analog* (19.9 g. from 10 g. **B** in 25 cc. cold H_2O treated with Br until the supernatant liquid retains a faint red-brown color after long vigorous shaking and short warming at 50° and then freed from the excess of Br with air), anhydrous crystals from 5 parts alc. at 40° + 10 parts H_2O , m. 123-4°, prisms with 1 H_2O , m. 86°, when the H_2O is added to the alc. soln. at room temp., decompd. by hot H_2O or alc.; 10 g. stirred with 15 cc. concd. NH_4OH , whereby a vigorous reaction, with evolution of $CHBr_3$ occurs, and finally warmed a short time at 70-80°, gives 5 g. *ammonium 1-ethyl-5-bromobarbituric acid*, prisms from concd. $NH_4OH \cdot EtOH$ (7:5), decomp. about 150°, easily decomp. in hot soln. Free acid (1.4 g. from 2 g. of the salt stirred with 8 cc. of 2 *N* HCl), stout prisms with 2 H_2O from 2 cc. alc. at 50° + 10 parts cold H_2O , m. 86-7°, and, anhydrous, turbid at 96°, clear at 103-4°. *5-Chloro acid* (0.75 g. from 1 g. of the above salt added to 5 cc. boiling concd. HCl), prisms with 2 H_2O from concd. HCl, sinters 90°, m. turbid 146°, clear 151°. *1-Ethyluramil* (2.5 g. from 4 g. of the violuric acid added in small portions to 18 g. concd. HI and 2 cc. H_2O at -20°, decolorized with cautious additions of a few particles of PH_3I and, if necessary, a few drops of H_2O , below 0° and allowed to stand 10 hrs. in a freezing mixt.), leaflets from concd. $HCl \cdot EtOH$ (8:35), decomp. 230°, soon becomes red in the air when moist, sol. in hot H_2O and alkalies with dark red color, easily sol. in concd. mineral acids and easily repptd. by alc. but not by neutralization; 6.5 g. heated 0.5 hr. on the H_2O bath with 5 g. KCNO in 20 cc. H_2O , then slowly treated hot with 5 cc. concd. HCl, dild. with 20 cc. H_2O , heated 15 min. longer, treated with 10 cc. alc. and cooled in a freezing mixt., gives 5.1 g. *1-ethylpseudouric acid*, lancet-like leaflets from 40 parts H_2O , reddens slightly at about 100°, becomes deep red at 200°, decomp. 218°; 4.5 g. boiled 0.5 hr. under a reflux with 40 cc. concd. HCl and 30 cc. H_2O and heated 1 hr. longer at 100° gives 3.8 g. *1-ethyluric acid*, lancet-like leaflets from H_2O , becomes faintly brown 335°, decomp. 350°, sol. in about 390 parts hot and 550 parts cold H_2O . In the synthesis of barbituric acids from **A** and ureas in the presence of $POCl_3$ are formed as by-products acetylbarbituric acids to which Conrad and Guthzeit assigned the structure $CO.NH.CO.NH.CO.CH:COAc$ but without any proof (*Ber.*

15, 2845(1882)). B. and W. find that they are also formed from **A** and ureas in the presence of Ac_2O when the latter is used in high concn. or by heating barbituric acids with Ac_2O ; all the Ac derivs. so obtained have ketonic properties, confirming the C. and G. formula. The isomeric enolic formula, $NH.CO.NH.CO.CH:COAc$, is excluded

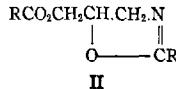
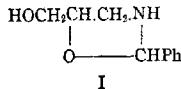
by the fact that none of them can be saponified. Crude 5-acetylbarbituric acid (C), m. 290-6°, is obtained in 12-g. yield from 10 g. dry **A** in 30 cc. cold, freshly distd. Ac_2O treated with 5 g. urea in small portions and then with a few drops concd. H_2SO_4 , gradually heated in the course of 2 hrs. under a reflux to 135°, gently boiled 3 hrs., filtered from the first crop (9.8 g.) which seps. on cooling and again boiled 4 hrs. In the prepn. a too rapid rise in the temp. is to be avoided and the purification of the crude product also requires caution, as too long heating of the aq. and especially the alk. soln. leads to deep-seated decompn.; 10 g. of the finely powdered product is taken up in 300 cc. boiling 2 *N* NH_3 , quickly boiled up with charcoal, cooled and acidified with HCl; yield, 7.1 g. Or it can be recrystd. from 125 parts boiling H_2O in the presence of charcoal

(avoiding long heating) or boiled with charcoal in 50 parts AcOH and treated with an equal vol. of alc.; in either case, 50% is recovered as a light yellow cryst. powder which after 3-4 recrystns. forms very small colorless needles, m. 296-300° (decompn.). It may also be obtained (0.8 g. of crude product) from 1 g. barbituric acid gently boiled 3-4 hrs. in 10 cc. Ac₂O. It is pptd. unchanged from solns. in concd. alkalies by acids; if the alk. soln. is boiled, NH₃ is soon evolved and on long boiling complete decompn. occurs; short boiling with dil. acids produces no change, nor does SnCl₄-HCl or HI at room temp. or on short boiling. From 1 g. of C in 5 cc. H₂O treated with Br as long as it is used up on vigorous shaking and then warmed a short time on the H₂O bath to complete the reaction and drive out the excess of Br is obtained 1.5 g. 5,5-dibromo-barbituric acid, m. 284°. *Oxime* of C (1.2 g. from 2 g. C and 2.6 g. NH₄OH-HCl in 100 cc. 2 N and 10 cc. concd. NH₄OH heated over a small flame until completely dissolved and then 2 hrs. on the H₂O bath), slender leaflets, m. 243° (decompn.), easily sol. in alkalies and NH₄OH. *Phenylhydrazone* (1.9 g. from 1.5 g. C heated 2 hrs. in the H₂O bath in 120 cc. AcOH with 3 g. PhNHNH₂), needles, m. 308-10° (decompn.), easily sol. in alkalies. *1-Methyl-5-acetylbarbituric acid* (9.8 g. from 8 g. A, 20 cc. Ac₂O, 5 g. MeNHCONH₂ and a few drops concd. H₂SO₄ heated 1 hr. on the H₂O bath and then slowly raised to the boiling point and heated 3 hrs.), pptd. from NH₄OH by HCl in rhombic leaflets, m. 207° (decompn.), sol. in alkalies and NH₄OH and repptd. unchanged by acids, slowly decompd. with evolution of NH₃ on boiling with NaOH, also obtained in 1-g. yield by gently heating 1 g. methylbarbituric acid in 8 cc. Ac₂O for 4 hrs.; 1 g. in 10 cc. H₂O with Br yields 1.8 g. 1-methyl-5,5-dibromo-barbituric acid, m. 114°. *Oxime* (2 g. from 2 g. of the ketone in 100 cc. alc. heated 2 hrs. on the H₂O bath with a soln. prep'd. by mixing 2 g. NH₄OH-HCl in 4 cc. H₂O and 4 cc. of a soln. of 2 g. Na in 15 g. MeOH, dig. with 10 cc. MeOH and filtering from the NaCl), needles from 50% alc., begin to decomp. 205°, m. 211-2° (decompn.). *Phenylhydrazone* (2.2 g. from 1.5 g. of the ketone, 2 g. PhNHNH₂ and 40 cc. AcOH), needles from alc., m. 223° (decompn.). *Hydrazone* (1.5 g. from 2 g. of the ketone in 20 cc. AcOH and 1 g. N₂H₄·H₂O heated 0.5 hr. on the H₂O bath), long needles from H₂O, m. 254° (decompn.). *1,3-Dimethyl-5-acetylbarbituric acid* (5.3 g. crude and 4.5 g. pure product from 5 g. CO(NHMe)₂, 6 g. A, 20 cc. Ac₂O and a few drops of concd. H₂SO₄), almost colorless rhombic leaflets, m. 195°, easily sol. in NH₄OH and alkalies and repptd. by acids, decompd. with evolution of NH₃ on long heating with concd. alkalies; 2 g. dissolved in 15 cc. concd. NH₄OH, then treated with 50 cc. alc. and cooled 12 hrs. yielded 0.8 g. of an ammonium salt, m. about 167° (decompn.). The ketone is also obtained in 1.1-g. yield from 1 g. dimethylbarbituric acid boiled 4 hrs. with 10 cc. Ac₂O; 1 g. yields with Br 1.5 g. 1,3-dimethyl-5,5-dibromo-barbituric acid, m. 172-3°. *Oxime* (1.5 g. from 2 g. of the ketone in 10 cc. alc. and an alc. soln. of NH₄OH prep'd. as described above, heated 1 hr. on the H₂O bath and dil. with 10 cc. H₂O), long flat prisms from H₂O, m. 145°. *Phenylhydrazone* (2.5 g. from 2 g. of the ketone and 2 cc. PhNHNH₂ in 20 cc. AcOH brought to boiling and heated 1 hr. on the H₂O bath), 4- or 6-sided leaflets from 10 parts alc., m. 182°. *Semicarbazone* (1.2 g. from 1 g. of the ketone in 10 cc. alc., 1 g. H₂NCONHNH₂-HCl and 1 g. KOAc in 2 cc. H₂O and a few drops dil. NH₄OH boiled 20 min.), prisms, m. 241°, easily sol. in dil. alkalies. *1-Ethyl-5-acetylbarbituric acid* (10.2 g. pure product from 10 g. EtNHCONH₂, 12 g. A, 25 cc. Ac₂O and a few drops H₂SO₄), fine needles from alc. H₂O or CHCl₃-petr. ether, m. 162-3°, easily sol. in dil. alkalies, slowly decompd. by hot alkalies with evolution of NH₃, also on long boiling with H₂O. It is also obtained in 1.1 g. yield from 1 g. B boiled 4 hrs. with 10 cc. Ac₂O; 10 g. in 50 cc. H₂O with Br gives 14.9 g. 1-ethyl-5,5-dibromo-barbituric acid, m. 124°. *Oxime* (1.4 g. from 2 g. of the ketone in 20 cc. dil. NaOH heated 1 hr. on the H₂O bath with 2.1 g. NH₄OH-HCl), needles from 1:1 alc., begins to decomp. 185°, m. 188-90°.

(decompn.). *Phenylhydrazone* (2.9 g. from 2 g. of the ketone), 6-sided leaflets from 200 parts alc., m. 210–1° (decompn.). *Semicarbazone*, needles, m. 242–5° (decompn.). *1,3-Diethyl-5-acetylbarbituric acid* (6.2 g. from 5 g. $\text{CO}(\text{NHET})_2$, 5 g. A, 20 cc. Ac_2O and a few drops of concd. H_2SO_4), b_{18} 168–70°, pptd. from NaOH by HCl in long needles, m. 61–2°; 1 g. with Br yields 1.5 g. 1,3-diethyl-5,5-dibromobarbituric acid, m. 85°. *Oxime* (2.1 g. from 2 g. of the ketone and 2.3 g. $\text{NH}_2\text{OH} \cdot \text{HCl}$), slender, elongated micro-tablets from H_2O , m. 159°, easily sol. in alkalies. *Phenylhydrazone* (2.2 g. from 2 g. of the ketone and 2 g. PhNH_2 in AcOH), leaflets from $\text{EtOH-H}_2\text{O}$ (4:3), m. 125°.

C. A. R.

Synthesis of α, β -diglycerides and unsymmetrical triglycerides. MAX BERGMANN, EDWIN BRAND AND FERDINAND DREYER. Univ. Berlin und Kaiser-Wilhelm-Inst. f. Faserstoffchem., Berlin-Dahlem. *Ber.* 54B, 936–65 (1921); cf. *C. A.* 15, 684–7.—A method for the prepn. of mixed glycerides, in order to be of many-sided applicability, must be of such a nature that the three HO groups of the glycerol can be so differentiated that it is possible to treat them differently at the individual stages of the process; the starting material must, therefore, be such that two of three substitutable groups in the glycerol are at first masked and are uncovered only in the further course of the synthesis and then only successively. A substance fulfilling these requirements is the compd. I which has but one alc. group available for esterification. A second, however, can be produced by the action of acids, whereby I is hydrolyzed to BzII and $\text{HOCH}_2\text{CH}(\text{OH})\text{CH}_2\text{NH}_2$, and finally the third is produced by treating the last compd. with HNO_2 . An advantage of I as the starting material is that it contains N which is retained in the intermediate products, thus facilitating their purification and the analytical control of their purity, but above all it affords a possibility of obtaining the glycerides, insofar as they are asymmetric, in optically active state, a valuable aid in establishing doubtful structures. In working out the method BzOH, $\text{O}_2\text{NC}_6\text{H}_4\text{CO}_2\text{H}$ and AcOH have been used rather than the natural fat acids as the derivs. of the former might be expected to have more promising properties, and the present paper deals only with these compds. but the method has already been applied successfully to the synthesis of glycerides of the natural fat acids. When I is treated with an acyl chloride, RCOCl , and $\text{C}_6\text{H}_5\text{N}$, and BzH is then split off, there results a compd. $\text{RCO}_2\text{CH}_2\text{CH}(\text{OH})\text{CH}_2\text{NHCOR}$ (A). If it is desired to prep. a mixed diglyceride, the second acyl group, $\text{R}'\text{CO}$, is introduced in the free HO group in A by the usual acylation methods and in the resulting compd. $\text{RCO}_2\text{CH}_2\text{CH}(\text{O}_2\text{CR}')\text{CH}_2\text{NHCOR}$ (B) the NHCOR group is replaced by HO in the manner described below. If, however, it is desired to prep. a homogeneous diglyceride, B is rearranged by means of PCl_5 and subsequent treatment with H_2O into the compd. $\text{RCOCH}_2\text{CH}(\text{O}_2\text{CR})\text{CH}_2\text{NH}_2 \cdot \text{HCl}$ (C). In this reaction there is formed an intermediate product containing Cl, probably the imide chloride, $\text{RCO}_2\text{CH}_2\text{CH}(\text{OH})\text{CH}_2\text{N:RCI}$, which possibly loses HCl , forming the compd. II, which then with H_2O gives C; if now, the NH_2 group in C



is replaced by HO by means of NaNO_2 the desired diglyceride results. If it is attempted to obtain the free base corresponding to C from its salts by treatment with the calcd. amt. of a base there is formed a thick oil which rearranges in a short time, even at room temp., into A, i. e., there occurs a rearrangement exactly the reverse of that originally produced by PCl_5 . To remove the NHCOR group in B, it is converted by means of PCl_5 and subsequent treatment of the resulting imide chloride with alc. into $\text{RCO}_2\text{CH}_2\text{CH}(\text{O})\text{CH}_2\text{N:RCI}$.

$\text{CH}(\text{O}_2\text{CR}')\text{CH}_2\text{NH}_2\text{HCl}$ and the NH_2 group in the latter replaced by HO by means of HNO_2 . Homogeneous α, β -diglycerides can be prepd. in the same way by first exhaustively acylating I and replacing the NHCOR group in the resulting $\text{RCO}_2\text{CH}_2\text{CH}(\text{O}_2\text{CR}')\text{CH}_2\text{NHCO}$ with HO . *z-Phenyl-5-methyloloxazolidine* (I), obtained practically quant. from 20 g. $\text{HOCH}_2\text{CH}(\text{OH})\text{CH}_2\text{NH}_2$ and 25 g. BzH rubbed together in 10 cc. AcOEt and recrystd. from AcOEt , seps. in prisms apparently consisting of a mixt. of isomers (since it contains 2 asym. C atoms, 2 inactive isomers are theoretically possible), m. indefinitely 75–9°, reacts alk. to litmus in H_2O , is decompd. with liberation of BzH by hot H_2O , warm alkalies and strong acids; 10 g. in 20 cc. cold dry CHCl_3 treated with 20 g. $\text{C}_6\text{H}_5\text{N}$ and then slowly with 17 g. BzCl , dild. after 24 hrs. with Et_2O , washed with very dil. H_2SO_4 , NaHCO_3 and H_2O , freed from the Et_2O by evapn., taken up in 30 cc. warm AcOEt and gradually treated with petr. ether, gives 85–90% of a mixt. of the stereoisomeric O, N -dibenzoyl derivatives, m. 116–20°, sepd. (8 g.) by slowly treating in 200 cc. alc. at 0° with 20 cc. 0.1 N HCl , whereupon in 45 min. 0.8 g. of one form seps., microneedles from AcOEt and petr. ether, m. 143°; the alc. mother liquors, concd. to 0.5 their original vol., deposit in 24 hrs. at 0° 3 g. of the second form, m. 118°. Either of the isomers or their mixt. (6 g.), in powdered form, shaken with 12 cc. Et_2O and 12 cc. HCl (d. 1.19) and treated after 20 min. with 150 cc. H_2O , yields about 90% of O, N -dibenzoyl- γ -aminopropylene glycol (D), slender, elongated, 6-sided tables from dil. alc., m. 109°, yields on further benzoylation the O, O', N -tribenzoyl derivative, identical with the product obtained by direct benzoylation of $\text{HOCH}_2\text{CH}(\text{OH})\text{CH}_2\text{NH}_2$, envelope-like crystals, m. 113–4°. D (6 g.) thoroughly rubbed with 5 g. PCl_5 , heated 2 min. on the H_2O bath until the vigorous evolution of HCl ceases, decompd. with 100 g. ice H_2O and heated about 2 hrs. at 60° with frequent stirring, whereby the original heavy oil is converted into a cryst. mass, washed with H_2O , ptd. 1–2 times from a little AcOH with considerable ether and crystd. from H_2O , gives about 75% of O, O' -dibenzoyl- γ -aminopropylene glycol hydrochloride (E), slender needles, m. about 203° (decompn.) on fairly rapid heating, sol. in 170 parts H_2O at 33°; nitrate, long needle-shaped microprisms, m. 185° (decompn.), sol. in 360 parts H_2O at 20°; nitrite, fine needles, decomp. about 70° on fairly rapid heating, can be recrystd. from luke-warm 50% alc.; at higher temps. its solns. decomp. owly, rapidly from 70° up; picrate, pointed light yellow needles from 50% alc., m. 187° (decompn.); neutral oxalate, long needles from H_2O , m. 173° (foaming) on fairly rapid heating, sol. in 1170 parts H_2O at 33°; acid lactate, prismatic needles from H_2O , begins to decomp. 184°; acid saccharate, fine needles from H_2O , decomp. about 174°. *Benzal derivative*, $\text{BzOCH}_2\text{CH}(\text{OBz})\text{CH}_2\text{N}(\text{CHPh})\text{CH}_2\text{OAc}$ (2 g. from 2 g. of E heated with 15 cc. H_2O , 1.5 cc. AcOH and 2 g. crystd. NaOAc until dissolved and then shaken 1–2 hrs. at room temp. with 0.7 g. BzH), long prisms from alc., m. 72–3°, mol. wt. in freezing PhOH 374, is unchanged by repeated crystn. from various solvents; 1 g. with 5 cc. alc. and 2.5 cc. concd. HCl regenerates E. E (3 g.) in 15 cc. of 50% AcOH treated at 0° with 1.5 g. NaNO_2 in a little H_2O yields in 1–2 min. α, β -dibenzoylglycerol as an oil which does not solidify and cannot be distd. even in a high vacuum and which was, therefore, not obtained quite pure (found, C 67.2, H 5.3; calcd. 68.0, 5.4%); 2.6 g. allowed to stand 24 hrs. in 5 cc. CHCl_3 and 3 g. $\text{C}_6\text{H}_5\text{N}$ with 1.8 g. $\text{p-O}_2\text{NC}_6\text{H}_4\text{COCl}$, treated with AcOEt and very dil. H_2SO_4 , washed several times with H_2O , evapd. and crystd. from MeOH gave 2.8 g. $\text{BzOCH}_2\text{CH}(\text{OBz})\text{CH}_2\text{OCOC}_6\text{H}_4\text{NO}_2$, m. 114°. When 14.25 g. E in 500 cc. hot H_2O is treated with 0.8 g. quinic acid and then with 1 mol. Ag quinate in 100 cc. H_2O , boiled a few min., filtered, decolorized with animal charcoal, evapd. in *vacuo*, taken up in 50 cc. of 95% alc. and seeded, it yields 70–90% of the *l*-quinate, $\text{C}_{22}\text{H}_{34}\text{O}_{10}\text{N}$, fine needles from 95% alc., m. 153°, $[\alpha]_D^{20} - 37.79^\circ$ (H_2O), 5 g. of which in 20 cc. cold H_2O treated with 5 cc. HCl (d. 1.19) yields 3.6 g. of the *l*-hydrochloride, m. 179°, foams about 198°, $[\alpha]_D^{19} - 14.25^\circ$ (50% alc.). The mother liquors

from the *l*-quinate contain more of this salt mixed with a larger amt. of the *d*-isomer and from them a mixt. of the HCl salts can readily be obtained; preliminary expts. indicate that the *d*-HCl salt can be purified by means of tartaric acid. When 2 g. of the *l*-HCl salt is converted as above into the oily *l*- α , β -dibenzoylglycerol and this is treated with *p*-O₂NC₆H₄COCl it gives 1.4 g. *l*- α , β -dibenzoyl- α' -*p*-nitrobenzoylglycerol, fine needles from MeOH, m. 113.5–4.0°, $[\alpha]_D^{20}$ –1.9° in (CHCl₃); this is the first known example of an optically active crystd. and perfectly pure glyceride of known structure. From 20.6 g. I in 70 cc. CHCl₃ and 35 g. C₆H₅N allowed to stand 24 hrs. with 42.7 g. *p*-O₂NC₆H₄COCl is obtained about 45 g. of a mixt. of stereoisomeric *O,N*-dibenzoyl-*2*-phenyl-5-methylol-oxazolidines, sepd. by boiling 10 g. in 100 cc. AcOEt a short time, filtering hot, extg. the residue once more with 50 cc. AcOEt and crystg. it from iso-AmOAc; this more difficultly sol. form seps. in stout prisms, m. 207–8°. The mother liquors, evapd. to $\frac{1}{2}$ their vol. and treated with petr. ether, yield the second isomer, flat prisms, m. 157–9°. *O,N*-Di-*p*-nitrobenzoyl- γ -aminopropylene glycol (7 g. from 10 g. of the preceding compd. in 30 cc. AcOEt heated a short time on the H₂O bath with 25 cc. HCl (d. 1.19), allowed to stand 1 hr., treated with 350 cc. H₂O and freed from the AcOEt *in vacuo*), fine needles, m. 139°; 2 g. intimately rubbed with 2 g. PCl₅, heated after 5 min. for a short time on the H₂O bath, treated with 15 cc. ice H₂O, heated about 3 hrs. at 60–70°, filtered after 24 hrs., taken up in AcOH containing a few drops concd. HCl and pptd. with Et₂O gives 87% of *O,O*'-di-*p*-nitrobenzoyl- γ -aminopropylene glycol hydrochloride, 4-cornered plates and needles from H₂O containing HCl, decomps. about 216° on rapid heating. α ,*N*-Dibenzoyl- β -*p*-nitrobenzoyl- γ -aminopropylene glycol (3 g. from 2 g. D, 4 g. C₆H₅N and 1.25 g. *p*-O₂NC₆H₄COCl), prisms from EtOH–H₂O, m. 154°; 10 g. shaken with 5 g. powdered PCl₅, warmed on the H₂O bath, freed from POCl₃ at 60° under 10 mm., dissolved in 20 cc. warm alc., treated with 50 cc. of 5 N HCl, filtered and extd. with hot H₂O yields about 50% of α -benzoyl- β -*p*-nitrobenzoyl- γ -aminopropylene glycol hydrochloride (F), microneedles from H₂O, m. 205–6° (decompr.) on rather rapid heating; nitrate, microneedles or prisms; acid oxalate, prismatic needles, decomps. 197°. The hydrochloride (1 g.) in 60 cc. H₂O treated with 2.5 cc. of *N* NaOH deposits an oil, which in the course of about 0.5 hr. rearranges into *O*-benzoyl-*N*-*p*-nitrobenzoyl- γ -aminopropylene glycol, crystals from C₆H₆ (yield, 0.73 g.), m. 128–9°. E can be obtained in 0.75 g. yield from 2 g. BzOCH₂CH(OBz)CH₂NHBz and 1.1 g. PCl₅ and subsequent treatment with alc. and dil. HCl. α -Benzoyl- β -*p*-nitrobenzoylglycerol (5.5 g. from 10 g. F in 175 cc. of 50% AcOH at 0° treated in small portions with 5 g. NaNO₂ in H₂O), microneedles or short prisms from AcOEt–petr. ether, m. 117–8°, gives with *p*-O₂NC₆H₄COCl in C₆H₅N 84% BzOCH₂CH(O₂CC₆H₄NO₂)CH₂O₂CC₆H₄NO₂, m. 122–3°, while 1.5 g. in 1.5 cc. CHCl₃ with 0.7 g. BzCl and 0.4 g. C₆H₅N yields 1.9 g. α , α' -dibenzoyl- β -*p*-nitrobenzoylglycerol, long, slender needles from Et₂O, m. 86–7°, and 1 g. shaken 24 hrs. with 1 cc. CHCl₃, 1 mol. AcCl and 1 mol. C₆H₅N gives α -acetyl- α' -benzoyl- β -*p*-nitrobenzoylglycerol, faintly yellow leaves from AcOEt–petr. ether, m. 67–8°. Treatment of D with 2,4-Cl₂C₆H₄COCl in C₆H₅N gives 30% of the β -*2,4*-dichlorobenzoyl derivative, m. 97–102°, from which, by the usual method, is obtained 50% α -benzoyl- β -*2,4*-dichlorobenzoyl- γ -aminopropylene glycol hydrochloride, crystals from EtOH–Et₂O, needles from H₂O, m. 170–2°, forms a nitrate and sulfates and with NaNO₂ in AcOH yields an oily α -benzoyl- β -*2,4*-dichlorobenzoylglycerol.

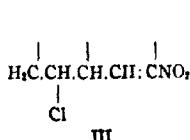
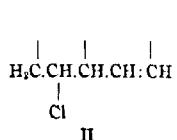
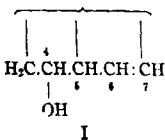
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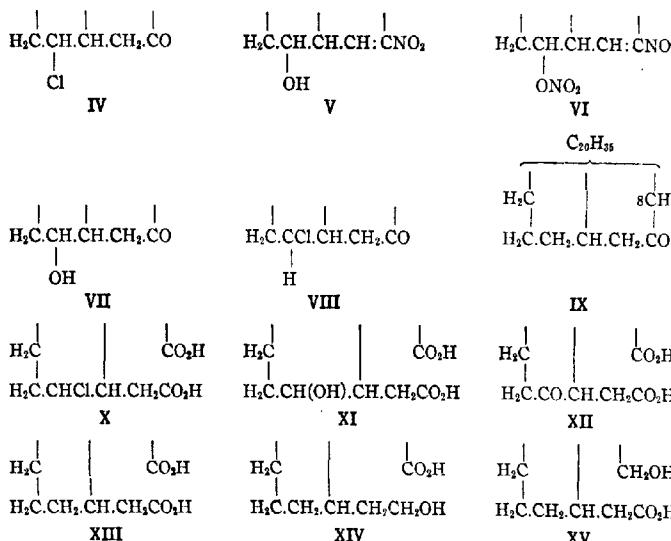
Remarks on the communication of Kurt Hess and Ernest Messmer: Synthesis of fatty acid derivatives of the sugars. GÉZA ZEMPLÉN. Techn. Hochschule Budapest. *Ber.* 54B, 980 (1921).—H. and M. (C. A. 15, 2422) do not mention Z.'s work, done 6 yrs. ago (C. A. 9, 2251).

CHAS. A. ROUILLER

Cholesterol. XXXI. Differing behavior of some stereoisomeric cholesterol derivatives. A. WINDAUS AND A. V. STADEN. *Ber.* 54B, 1059–66 (1921); cf. C. A. 14,

3084.—A further example of the great difference in chem. behavior often shown by stereoisomeric cholesterol derivs. is given in the present paper. Cholesterol (I) with PCl_5 yields II, which with fuming HNO_3 forms III, and this is reduced by Zn dust to α -chlorocholestanone (IV). On the other hand, I with fuming HNO_3 forms V or VI, which is reduced to VII, and this with PCl_5 forms β -chlorocholestanone (VIII); *i. e.*, the two stereoisomers are formed by the same reactions but carried out in different order, in one case the HO being replaced by Cl in an unsatd. alc. (I), in the other in a keto alc. (VII); in one of these reactions the Cl has not taken the place of the original HO and a Walden inversion must have occurred and, in fact, so smoothly, that each of the two isomers is obtained free from the other form. That IV and VIII are really structurally identical stereoisomers was shown as follows: Both can be converted, although by different methods, into the same compd. IX and, therefore, contain the O atom on the same C atom 7. By fuming HNO_3 the two isomers are converted into two isomeric di- CO_2H acids (X) and further by KOH into two isomeric HO acids (XI) and both of the latter on oxidation yield the same keto acid (XII), showing that the Cl atom in both IV and VIII is attached to the same C atom 4. That in the formation of the acids X the cleavage has occurred between C atoms 7 and 8 and not between 6 and 7 is shown by the fact that XII on reduction by Clemmensen's method yields the known acid XIII. As already observed by Mauthner and Suida (*Monatsh.* 24, 656 (1903)) IV can be boiled many hrs. with Zn dust and AcOH without change, while on the other hand VIII after 4 hrs. boiling yields IX. With alc. KOH IV, even at 50° , splits off 1 mol. HCl in a few min. and forms heterocholestenone (*C. A.* 13, 1844) while under the same conditions VIII is unchanged. When 1.5 g. of the β -form of X (*Ber.* 37, 3704 (1904)) in 130 cc. AcOH is boiled 6 hrs. under a reflux with 10 g. Zn dust and 5 cc. concd. HCl , 5 g. more Zn dust being added during the reaction, then treated with H_2O and taken up in Et_2O and the Et_2O ext. is freed from acid constituents with dil. KOH , which is then acidified, extd. with Et_2O , evapd. and crystd. from Me_2CO there is obtained 1 g. of an acid (XIV or XV), needles from dil. AcOH , m. 212° , does not decolorize dil. KMnO_4 . The Et_2O soln. of the neutral products on evapn. and crystn. from petr. ether yields the lactone of the above acid, needles, m. 118° , converted into the acid by heating 4 hrs. on the H_2O bath with KOH in MeOH ; conversely, the acid, covered with Ac_2O and, after evapn. of the latter, distd. *in vacuo*, gives the lactone, also obtained by boiling the acid with a very little Ac_2O and letting cool. The acid XII (2.5 g.), obtained from the β -form of X as described in an earlier paper, in 100 cc. AcOH boiled under a reflux with 10 g. of Clemmensen's Zn-Hg for 8 hrs., 30 cc. concd. HCl being added during the course of the boiling, gives XIII, m. 273° , identical with the product obtained from heterocholestanone. The α -form of X, from 5 g. IV covered with a cold mixt. of 30 cc. AcOH and 35 cc. fuming HNO_3 (d. 1.52), heated 25 min. at 60 – 70° , cautiously treated with H_2O to incipient turbidity and cooled with ice, long needles from AcOH , m. 263 – 4° ; dissolved in just the necessary amt. of hot Ac_2O , refluxed 1 hr. and cooled to 0° , it yields the anhydride, m. 124° ; the acid is unchanged by boiling 17 hrs. in AcOH with Zn dust and concd. HCl but 2 g. heated 8 hrs. on the H_2O bath with 20 cc. of 25% KOH , yields the α -hydroxy acid (XI), leaflets from aq. Me_2CO , m. 218° , 2 g. of which in 60 cc. AcOH warmed 45 min. with 20 cc. of 2% CrO_3 yields XII, m. 255° .

 $\text{C}_{27}\text{H}_{39}$ 



CHAS. A. BOUILLET

Normal amylobenzene and some of its derivatives. L. GUY RADCLIFFE AND N. SIMPKIN. *J. Soc. Chem. Ind.* 40, 119-22T (1921).—Normal amylobenzene (A) was prep'd. by Schramm (*Ann. 218*, 388 (1883)) by the action of Na on a mixt. of PhCH_2Br (C) and BuBr (B). R. and S. modified Schramm's prep'n. by the substitution of PhCH_2Cl (D) for C. Subsidiary reactions, causing the formation of bibenzyl, octane and unidentified compds., lower the yield to about 25% of the theoretical. *Experimental*.—B was prep'd. with 87.7% yield by treating 212 g. BuOH with 36 g. red P and 255 g. Br_2 . C was prep'd. by direct bromination of boiling PhMe ; yield 60% of colorless liquid, b. 198-202°. D was obtained by fractionation of the com. product, the portion b. 176-9° being used. A was prep'd. by adding 34.5 g. Na wire to a mixt. of 128 g. C with 103 g. B; after $\frac{1}{4}$ of the Na had been added below 50° the action slackened and the mixt. was heated to 80°. After $\frac{1}{2}$ the Na had been added, the mixt. was dild. with 100 cc. dry C_6H_6 and boiled; the remainder of the Na was then added and the mixt. boiled 25 hrs. The C_6H_6 was then distd. off, and the residue steam-distd. to obtain A. When crystals appeared in the distillate the receiver was changed and bibenzyl, m. 52°, was obtained. The oily distillate was fractionated, and gave a 27.6% yield of crude A, b. 195-205°. The crude A was boiled with alc. KOH, the alc. distd. off, and the residue steam-distd. The oily distillate was heated at 105° with Na and refractionated; the product b. 200.5-2.0° was collected as pure A. It was later found that D gave as good a yield as C, and that C_6H_6 should not be added, but the mixt. should stand a few days without heating in order to complete the reaction. A was also prep'd. by treating a mixt. of PhBr and synthetic AmBr with metallic Na. The product was identical with that prep'd. by the interaction of D and B, and the yield was 2-3 times as great. *Properties of A*.—Colorless liquid, sol. in alc., C_6H_6 , Et_2O , CS_2 , methyl, CHCl_3 , glacial AcOH , warm H_2SO_4 , warm 70% HNO_3 , $d_{15}^{16.5}$ 0.8664, d_{15}^{20} 0.8651, d_{22}^{20} 0.8624, d_4 0.8602; n_{D}^{15} 1.4751. *Sulfonation* of A with concd. H_2SO_4 and neutralization with BaCO_3 gave a 54% yield of $\text{Ba}(\text{C}_1\text{H}_1\text{SO}_4)_2$ (F), white needles.

Treatment of **F** with PCl_5 gave flat needle-shaped crystals of *amylbenzene-p-sulfonyl chloride* (**G**) m. 38–9°, sol. in Et_2O , petr. ether, CHCl_3 , C_6H_6 , CCl_4 , CS_2 , sparingly sol. in cold. alc. Treatment of **G** with $(\text{NH}_4)_2\text{CO}_3$ gave white hair-like crystals, m. 86–7°, of *amylbenzene-p-sulfonamide*, which gave by oxidation with KMnO_4 *p-sulfaminobenzoic acid*, m. 278–80°. *p-AmC₆H₄SO₃K* was fused with KOH at 330–40° in H; the melt gave *amylphenol*, b. 262°, sparingly sol. in boiling H_2O , readily sol. in aq. NaOH, Et_2O , AcOH, or alc., crysts. when chilled in a freezing mixt. *Benzoylamylphenol* crysts. from alc. in white needles, m. 52°. A *bromo derivative* was prep'd., m. 88–9°. By adding a mixt. of 40 g. HNO_3 (d. 1.508) with 20 g. glacial AcOH to 20 g. **A** in 20 g. glacial AcOH at 20°, heating to 50° and pouring into ice-water, *p-nitroamylbenzene* is formed, b. 158–9°, d₁₁ 1.0650, miscible with the usual organic solvents, by oxidation with KMnO_4 gives *p-O₂NC₆H₄CO₂H*.

T. S. CARSWELL

Catalytic decomposition of halogenated hydrocarbons. A. MAHLÉ. *Caoutchouc et gutta-percha* 18, 10908–11 (1921); *Mat. grasses* 13, 5855–8.—The formation of aromatic hydrocarbons, olefins and their secondary and tertiary derivs. by substitution or elimination of the halogen by H in both mono- and polyhalogen compds. is reviewed. No new research is reported.

C. C. DAVIS

Action of bromocyanogen on triphenylphosphine. WILHELM STEINKOPF AND KURT BUCHHEIM. *Techn. Hochschule Dresden. Ber.* 54B, 1024–35 (1921); cf. Steinkopf and Müller, *C. A.* 15, 2882.— Ph_3P is obtained in 130 g. yield of crude (m. 73°) and 95 g. of pure (m. 79°) product from 300 g. PhBr and 47 g. Mg in 1200 g. Et_2O in ice-salt slowly treated with 115 g. PhPCl_2 in 300 cc. Et_2O and 100 cc. C_6H_6 , then heated 1 hr. on the H_2O bath, treated with ice and HCl until just acid, sep'd. from the aq. layer, dried with CaCl_2 , fractionated *in vacuo* in a current of CO_2 and crystd. from Et_2O – EtOH . If 8.5 g. Ph_3P in 85 g. dry Et_2O is treated at –10° with 3.4 g. BrCN in 35 g. Et_2O , every drop of the latter soln. produces a white ppt. balling to a resinous mass which, however, disintegrates again in the course of the expt.; it seps. from Me_2CO or CHCl_3 in long thick columns, m. 141.5°, and has the compn. of a *basic triphenylphosphine oxybromide* (**A**), $\text{Ph}_3\text{P}(\text{OH})_2\text{Ph}_3\text{P}(\text{OH})\text{Br}$; the original Et_2O mother liquor on evapn. leaves Ph_3PO , tables from petr. ether, m. 153–3.5°. If the BrCN is distd. from freshly dehydrated CaCl_2 , in a large weighing glass provided with a ground glass cover carrying inlet and outlet tubes is connected with a test-tube (further connected with acidified AgNO_3 and Cl-free NaOH wash bottles) containing 1 mol. Ph_3P in Et_2O boiled several hrs. over Na–K alloy and the BrCN is driven over into the Ph_3P by means of N dried over H_2SO_4 and P_2O_5 , a white ppt. at once forms in the Et_2O ; soon after the Et_2O has begun to evap. AgCN begins to ppt. in the AgNO_3 soln. and in the NaOH (CN), can be detected by means of HNO_3 and AgNO_3 ; the amts. of HCN and (CN)₂ formed vary with the amt. of moisture in the reagents and app.; when little HCN is formed much (CN)₂ is produced, and *vice versa*. When only little HCN is produced, *i. e.*, when the amt. of moisture is small, evapn. of the Et_2O leaves a white substance which fumes strongly in the air, dissolves in Me_2CO with formation of a very irritating substance (probably MeCOCH_2Br), and has the compn. of a *hexaphenylidiphosphonium dibromide*, (Ph_3PBr)₂; heated *in vacuo* it begins to m. about 210° (bath temp.) and at 230° under 20 mm. there dists. 2.1 g. Ph_3P and there remains in the flask 4.2 g. of a dark brown substance converted on standing in the air or on recrystn. from moist Me_2CO into **A** and by H_2O into Ph_3PO , and having the compn. of *triphenylphosphine dibromide*, also obtained from Ph_3P in cold petr. ether and the calcd. amt. of Br in the same solvent. The splitting of (CN)₂ can also be shown in the absence of solvents; if BrCN distd. from Na is covered with perfectly dry Ph_3P in a vessel connected with acidified AgNO_3 and with Et_2O and a gentle current of air, dried over P_2O_5 , is passed through the resulting soln., which is then warmed, the mixt. begins to foam at 60–70°, after a short time the evolu-

tion of gas ceases, the mixt. solidifies, fumes strongly in the air and m. again only at about 210–20°. Under these conditions HCN is formed only in traces; the Et_2O wash bottle contains BrCN and much $(\text{CN})_2$. When, in the condensation in Et_2O , as the result of the presence of more moisture, but little $(\text{CN})_2$ and much HCN are formed, the substance remaining after evapg. the Et_2O likewise fumes strongly in the air, is insol. in indifferent solvents, reacts with alc. and PhOH and has the compn. of *anhydro[triphenylphosphine oxybromide]*, $(\text{Ph}_3\text{PBr})_2\text{O}$; it m. *in vacuo* 140–50° (bath temp.), soon afterwards evolves gas (PhBr_2) and at 226° under 25 mm. almost pure Ph_3P dists. over and in the neck of the flask there is deposited a small amt. of substance having the m.p. (189–90°) of $\text{Ph}_3\text{PO}_2\text{H}$. It is assumed that $\text{Ph}_3\text{P}(\text{CN})\text{Br}$ is first formed in all of the above reactions and that their mechanism can be represented by the following scheme: $\text{Ph}_3\text{PBrPBrPh}_3 + (\text{CN})_2 \xleftarrow{(\text{heat})} 2\text{Ph}_3\text{P}(\text{CN})\text{Br} + 2\text{H}_2\text{O} - \text{HCN} \longrightarrow [2\text{Ph}_3\text{P}(\text{OH})\text{Br}] (-\text{H}_2\text{O}) \longrightarrow \text{Ph}_3\text{PBr}_2\text{O.PBrPh}_3 + (\text{H}_2\text{O} - \text{HBr}) \longrightarrow [\text{Ph}_3\text{P}(\text{OH})_2\text{O.PBrPh}_3] (+\text{H}_2\text{O}) \longrightarrow \text{Ph}_3\text{P}(\text{OH})_2\text{O.PBrPh}_3 + (\text{H}_2\text{O} - \text{HBr}) \longrightarrow 2\text{Ph}_3\text{P}(\text{OH})_2$ or $2\text{Ph}_3\text{PO}$. The *triphenylphosphine bromocyanide* itself was obtained by using as the solvent petr. ether boiled several hrs. over Na-K alloy, distg. the BrCN over CaCl_2 and Na, passing the N through acidified $\text{K}_2\text{Cr}_2\text{O}_7$, alk. pyrogallol, H_2SO_4 and P_2O_5 and employing a special app. (which is described). It is so sensitive to moisture that it could be analyzed only while still moist with petr. ether and its compn. detd. from the $\text{Br}:\text{CN}:\text{P}$ ratios; in the air it changes into A and with H_2O gives Ph_3PO .

C. A. R.

New heterocyclic compounds. E. V. ZAPPI. *Anales soc. quim. Argentina* 8, 55–66 (1920).—A number of the newer heterocyclic compds. contg. P, As, Sb, Bi, Si, Sn, Pb, or Hg, as a member of the ring are described and references given. The following reactions were attempted by Z.: $\text{CH}_2\text{Cl}(\text{CH}_2)_3\text{CH}_2\text{Cl} + \text{Me}_2\text{AsO}_2\text{H} \longrightarrow 2\text{MeCl} + \text{CH}_2(\text{CH}_2)_3\text{AsO}_2\text{H}$ and $\text{CH}_2\text{Cl}(\text{CH}_2)_3\text{CH}_2\text{Cl} + \text{Et}_2\text{Hg} \longrightarrow 2\text{EtCl} + \text{CH}_2(\text{CH}_2)_3\text{Hg}$. The

MeCl and EtCl formed were identified but the exact compn. of the other products obtained was not detd. These products were thick, bad smelling oils which could be distd. under reduced pressure without decomprn. They were insol. in H_2O but sol. in all the common org. solvents.

L. E. GILSON

Velocity of saponification of *p*-nitrophenetole. A. V. BLOM. *Helvetica Chim. Acta* 4, 510–6 (1921).—The formation of ethers from $\text{ClC}_6\text{H}_4\text{NO}_2$ and alcoholates led to the study of the rate of hydrolysis of the nitrophenol ethers. B. has studied the hydrolysis of $p\text{-O}_2\text{NC}_6\text{H}_4\text{OEt}$ (A) at 70° and at about 80°. He has followed the course of hydrolysis by the difference between parallel titrations with Congo red and phenolphthalein. The gradual decrease in the Congo red titer is assumed to be a measure of the formation of the azoxy compd. Starting with 16.7 g. A and 5.62 g. KOH in 170 cc. 95% alc. and 44.5 cc. H_2O , B. obtained at 70° a 40% conversion to $p\text{-O}_2\text{NC}_6\text{H}_4\text{OH}$ (C) in 176 hrs. (azoxy compd. = 2.0%), and at about 80° a 66% conversion to C in 173 hrs. (azoxy compd. = 13.2%). For the hydrolysis at 70°, $K_2 = 0.43 \times 10^{-4}$ and at 80°, $K_2 = 1.15 \times 10^{-4}$. For the azoxy compd. formation at 70°, $K_1 = 0.014 \times 10^{-4}$ and at 80° $K_1 = 0.10 \times 10^{-4}$.

O. B. H.

The dehydration of 1-phenyl-2,2-dimethyl-1-butanol and of 1,3-diphenyl-2,2-dimethyl-1-propanol. J. APOLIT. *Compt. rend.* 172, 1493–6 (1921).—The work of Haller and others established a method of prep. sec. alc. of the type $\text{PhCH}(\text{OH})\text{CR}'\text{R}''\text{R}'''$ (C. A. 3, 1161, and later showed that the dehydration of $\text{Me}_2\text{CCH}_2\text{PhOH}$ gave CMe_2CMePh (*Bull. soc. chim.* [4] 27, 731 (1920)), involving thereby the migration of a Me radical. A. has shown that dehydration of $\text{EtCMe}_2\text{CHPhOH}$ gives both PhEtC: CMePh and PhMeC: CEtMe , and similarly $\text{PhCH}_2\text{CMe}_2\text{CHPhOH}$ gives both $\text{PhMeC: CMeCH}_2\text{Ph}$ and $\text{Ph}(\text{PhCH}_2)\text{C: CMe}_2$.

O. B. H.

Action of semicarbazide on unsaturated ketones. K. v. AUWERS. Marburg.

Ber. 54B, 987-1000(1921).— $\text{H}_2\text{NCONHNH}_2$ (A), like NH_2OH , can add to unsatd. compds. but the scope of the reaction seems to be much more limited than in the case of NH_2OH . Thus Rupe, as a result of his systematic investigations (*C. A.* 4, 773, and earlier papers) concluded that of the unsatd. ketones only those of the aliphatic series can form semicarbazinosemicarbazones and that there are exceptions even among these; he believed, especially, that neither hydroaromatic ketones nor those with a Ph group can add A. It has since been shown that this is not true of cyclohexenone and its alkyl derivs. (Mazurevich, *C. A.* 8, 1420) and Wallach had already found (*Ann.* 331, 326 (1904)) that it does not hold for camphorophrone. v. A. has now found, in connection with a study of the transformation of aromatic ketones with unsatd. side chains into bicyclic compds., that R.'s generalization must be further modified. R. studied ketones of the type PhCH:CHCOR in which, probably, the Ph adjacent to the double bond, by filling the space prevented the addition of A, but the isomeric ketones PhCOCH:CHR react with 2 mols. A like purely olefinic ketones. In the majority of the cases studied the reaction proceeds rapidly and smoothly, most of the ketone being converted into the semicarbazinosemicarbazone in the course of 1-2 days, sometimes in an even shorter time. From 5.5 g. PhCOCH:CHMe allowed to stand overnight in aq. alc. with 11 g. A.HCl and 13 g. crystd. NaOAc is obtained β -semicarbazinopropyl phenyl ketone semicarbazone, cryst. crusts from H_2O , m. 195-7°, difficultly sol. in dil. HCl if dry but at once if previously moistened with alc. β -Semicarbazinopropyl *p*-cresyl ketone semicarbazone, finely cryst. mass from alc., m. 159-60°, sol. in dil. mineral acids. Propenyl *p*-cresyl *o*-ketone methyl ether, $\text{Me}(\text{MeO})\text{C}_6\text{H}_4\text{COCH:CHMe}$, from *p*-Me₂C₆H₄OMe and MeCH:CHCOCl in CS_2 in the presence of only 1 mol. AlCl₃, b₁₅ 156-61°, gives with A.AcOH in aq. alc. at room temp. the semicarbazino semicarbazone, cryst. powder from AcOH- H_2O , m. 205-6°, sol. in HCl. β -Semicarbazinopropyl *p*-cresyl ketone semicarbazone, from the unsatd. ketone and A.HCl in aq. alc. after about 2 weeks, m. 200-1°, slowly sol. in aq. NaOH and repprd. by cautious addition of acid, sol. in excess of acid and repprd. from concd. soln. by NH₄OH; on attempting to recryst. it from hot 50% alc. it yielded crystals softening somewhat far below 200° and melting indefinitely. Hoping to prep. PhCOCH:CM_2 (B) more rapidly than by Kohler's method (*C. A.* 4, 310), v. A. slowly treated 13.5 g. each of $\text{Me}_2\text{C:CHCOCl}$ and C_6H_5 in 40 cc. cold CS_2 with 16.7 g. AlCl₃; at first there was no reaction but on placing the flask in sunlight a gentle evolution of HCl began and was complete in 20 min., the product, worked up in the usual way, yielded a yellow oil, b₁₄ 126-40°. As K.'s ketone b₂ 148°, the whole distillate was treated with 2.5 mols. A in aq. alc. and after 2 days yielded what proved to be a monosemicarbazone, $\text{C}_9\text{H}_{11}\text{ON}_2$, fine needles from alc., C_6H_6 or AcOEt, m. 205-7°. Further expts. showed that the compd. in question is formed in greater amt. if after the illumination the mixt. is gently warmed a long time on the H_2O bath. After repeated fractionation it b₁₅ 130-1°, is perfectly colorless and instead of the expected B is really 3,3-dimethyl-1-hydridone (C), d₄^{14.25} 1.0320, d₄²⁰ 1.027, n_D 1.54026, 1.54525, 1.55936, 1.57182 for α , D, β and γ at 14.25°, E₂ 1.12, 1.16, 40%, 42% for α , D, β = α and γ = α , resp. Its constitution was established by dissolving 10 g. $\text{Me}_2\text{C:CHCO}_2\text{H}$ in 50 g. HBr satd. at 0°, treating 15 g. of the resulting $\text{Me}_2\text{CBrCH}_2\text{CO}_2\text{H}$ (which is obtained in 18% yield) with 7.6 g. PCl₅, warming gently on the H_2O bath, pouring off the oil, distg. *in vacuo*, treating the distillate (8 g. b₁₅ 80-90°) in a little CS_2 with 3.2 g. C_6H_5 and 5.5 g. AlCl₃, letting stand overnight, heating on the H_2O bath until no more HCl was evolved, again treating with the same amt. of AlCl₃ and again heating; on working up the product in the usual way C was obtained. An attempt was then made to prep. B by K.'s method, but the yield was so small that the action of A on B was not studied. Unlike the preceding compds. 5,2-Me(HO)₂C₆H₃COCH:CM₂, (D) with either 1 or 3 mols. A-HCl and NaOAc yields only the addition product, β -semicarbazinoisobutyl *p*-cresyl ketone,

silky needles from MeOH, m. 148–9°, forms on rubbing with dil. HCl a salt which dissolves on diln. with much H₂O, repprd. by NaOH but sol. in excess, does not react with excess of A but on the other hand 0.8 g. in dil. NaOH with 0.42 g. NH₂OH.HCl allowed to stand overnight and acidified gives the *oxime*, Me(HO)₂C₆H₄C(=NOH)CH₂CMe₂NHNHCONH₂, crystals from alc., m. 202–3°. D boiled 8 hrs. in alc. with 2 mols. NH₂OH.HCl and then pptd. with H₂O yields *isobutienyl p-cresyl ketone oxime*, stout prisms from ligroin, m. 130.5–1.5°, easily sol. in alkalies if previously moistened with alc.; on the other hand 0.95 g. D, 0.7 g. NH₂OH.HCl and 0.84 g. NaHCO₃ allowed to stand in aq. MeOH at room temp. yield *β-hydroxylaminoisobutyl p-cresyl ketone*, stout crystals from MeOH, m. 139–40°, sol. in HCl and NaOH but not in NH₂OH. A sample of PhCOCH:CHMe prep'd. by K.'s method from C₆H₆ and MeCH:CHCOCl b₁₂ 122–3° (K. gives b₂₀ 135°), d₄^{18.3} 1.0298, d₄²⁰ 1.028, n 1.55465, 1.56091, 1.57896, 1.59544 for α, D, β and γ at 18.3°, EΣ 1.04, 1.10, 50%, 57% for α, D, β – α and γ – α; it rapidly absorbs 1 mol. Br₂ in CS₂, yielding PhCOCHBrCHBrMe, needles from petr. ether or alc., m. 98–9°, while K., who prep'd. it from MeCHBrCHBrCOCl and C₆H₆, gives 112°. A repetition of his work showed as a first discrepancy that the MeCHBrCHBrCOCl b₁₂ 82–3°, while he gives b₂₀ 112°, and the MeCHBrCHBrCOPh obtained from it m. 98–9°. CHAS. A. ROUILLER

Phenylhydrazine derivatives of unsaturated aliphatic-aromatic ketones and their transformation products. KARL V. AUWERS AND ELISABETH LAMMERHIRT. Marburg, *Ber.* 54B, 1000–24 (1921); cf. preceding abstr.—It has been found in the present investigation that ketones of the type PhCOCH:CHR give with free hydrazines pyrazolines, while those of the type *o*-HOC₆H₄COCH:CRR' yield either monohydrazino derivs. or hydrazinohydrazone; the latter are easily oxidized to azo compds. and broken down by boiling with dil. AcOH to hydrazone of *o*-acetophenols; the *p*-nitrophenylhydrazone of 5,2-Me(HO)C₆H₄COCH:CMe₂ (A) rearranges either into a pyrazoline or into a chromanone, depending on the conditions. Although Kohler states that PhCOCH:CHMe and PhNHNH₂ (B) in alc. AcOH do not seem to react at room temp. but yield 5-methyl-1,3-diphenylpyrazoline on long boiling, v. A. finds that the reaction takes place at room temp. and the pyrazoline begins to sep. after a short time from an equimol. mixt. of the components in a mixt. of equal vols. of alc. and AcOH; it m. 104–5° (K. gives 108°), yields no trace of PhNH₂ with Na-Hg and AcOH and gives with FeCl₃ in concd. H₂SO₄ a deep blue color. *Propenyl phenyl ketone p-nitrophenylhydrazone*, from equimol. amts. of the ketone and O₂NC₆H₄NHNH₂.HCl allowed to stand overnight in alc., reddish brown prisms from AcOEt, m. 151–2°, does not give the Knorr pyrazoline reaction but on reduction yields *p*-C₆H₄(NH₂)₂; the presence of the NO₂ group, therefore, hinders the pyrazoline formation. PhCOCH:CMe₂, prep'd. by K.'s method from Me₂CB₂CHBr-COPh and KI, was made only in small amt. on account of the cost of the materials and was not obtained perfectly pure; only qual. tests were made, therefore, on its behavior towards B. When equimol. amts. of the ketone and B were allowed to stand in alc. the mixt., when worked up, yielded a viscous substance which could not be made to cryst. and gave no trace of a pyrazoline reaction; it was, therefore, probably the impure phenylhydrazone, which, according to K., m. 88° but becomes brown and oily in a few hrs. In a second expt. the ketone was boiled several hrs. with 2 mols. B in mixt. of 3 parts AcOH and 1 part alc.; the oily product resulting showed the typical pyrazoline reaction and was probably *5,5-dimethyl-1,3-diphenylpyrazoline*. From 1 g. *p*-MeOC₆H₄COCH:CHMe and 0.5 g. B in 5 cc. of EtOH-AcOH (1:1) allowed to stand some hrs. at room temp. or from the ketone and 2 mols. B in 3:1 EtOH-AcOH allowed to stand at room temp. or heated on the H₂O bath is obtained *5-methyl-1-phenyl-3-p-anisylpyrazoline*, leaflets from alc., m. 137–8°, sol. in cold C₆H₆ and CHCl₃ and hot ligroin with blue fluorescence and in MeOH, EtOH and AcOH without fluorescence, gives in concd. H₂SO₄ with FeCl₃ a strong blue-violet color. *5-Methyl-1-phenyl-3-p-cresylpyrazoline*,

from equimol. amts. of $5,2\text{-Me}(\text{HO})\text{C}_6\text{H}_4\text{COCH:CHMe}$ in alc. and a little AcOH heated some hrs. on the H_2O bath, fine, faintly yellowish, silky needles from MeOH, m. 122.5-3.0°, gives a deep blue color in concd. H_2SO_4 with FeCl_3 , is also obtained in 1:1 EtOH-AcOH with 2 mols. **B** after 5 hrs. boiling. On the other hand, when **A** in alc. and 2 mols. **B** in an equal vol. of AcOH are allowed to stand at room temp. there begin to sep., in 15 min. to 1 hr., depending on the concn., yellowish needles whose amt. quickly increases. As soon as the sepn. is complete, they are filtered, washed with alc. and crystd. from heavy benzine- C_6H_4 . This same compd., β -phenylhydrazinoisobutyl *p*-cresyl ketone phenylhydrazone (**C**), is also obtained from **A** and 2 mols. **B** boiled one or more hrs. in alc. alone. It seps. in faintly yellowish prisms, m. 139-41°, mol. wt. in freezing C_6H_4 390-401°; shaken in AcOEt or luke-warm alc. with dil. HCl it soon deposits **B**-HCl and the filtrate on evapn. yields a mixt. of different products, among which the unchanged **C** and its oxidation product could be detected; whether the monophenylhydrazone of **A** or the isomeric pyrazoline or the phenylhydrazones of a chromanone was also formed could not be detd. with the small amt. of material available. If **C** in alc. is allowed to stand in a wide beaker or bowl exposed to the air for several days or if it is shaken in C_6H_4 with O₂ or, still better, if it is boiled a few min in dil. alc. soln. with FeCl_3 , heated a short time with 30% H_2O_2 and a little NaOH or treated in hot alc. with freshly pptd. HgO , it gives β -benzenecarboxyisobutyl *p*-cresyl ketone phenylhydrazone, fine orange-yellow needles, m. 123-4°, mol. wt. in freezing C_6H_4 384-91, unchanged by several hrs. boiling in EtOH-AcOH but when boiled 1 day with AcOH and evapd. in a vacuum desiccator it yielded a tarry product. The azo compd. moistened with alc. dissolves almost completely in concd. HCl with dark brown-red color but soon seps. out again; heated with HCl, it resimifies. If the **A** in concd. alc. soln. is heated on the H_2O bath with 2 mols. **B** in an equal vol. of AcOH it regularly gives, in good yield, $5,2\text{-Me}(\text{HO})\text{C}_6\text{H}_3\text{C}(\text{:NNHPh})\text{Me}$ (**D**), crystals from MeOH, m. 154-5°, also formed by boiling **C** under a reflux in 1:1 EtOH-AcOH; if the **C** is boiled in alc. with 1-2 drops HCl it yields a tarry product. No Me_2CO , $\text{Me}_2\text{C:NNHPh}$ or PhNNHN_2 could be detected in the mother liquors from **D**, and at present it cannot be stated how the residue- CMe_2NNHPh is eliminated from **C**. **A** in alc. alone with somewhat more than 2 mols. β -Br $\text{C}_6\text{H}_4\text{-NNHN}_2$ gave in every case but one (see below) good yields of β -*p*-bromophenylhydrazinoisobutyl *p*-cresyl ketone *p*-bromophenylhydrazone (**E**); in the cold, it sepd. in shorter or longer time, depending on the concn., in stout, yellowish crystals; in hot solns. a ppt. was at once formed. In mixed solvents (EtOH-AcOH in varying proportions) the results were the same in the cold; in only one case, where the soln. had been much dild. and allowed to stand overnight in the air, the azo compd. was obtained instead of **E**. When a concd. EtOH-AcOH (3:1) soln. of **A** and the hydrazine was boiled, **E** was the chief product, as under these conditions it sepd. quickly and was not changed by further boiling, and **F** (below) was formed in only small amt., but when the dild. was such that sepn. occurred only after some time the product was **F**. **E** generally seps. in light yellow prisms, m. 167-70°, sol. in alc. with yellow color, repprd. by H_2O , decompd. by HCl with elimination of $\text{BrC}_6\text{H}_4\text{NNHN}_2$; 2.1 g. in alc. boiled 15 min. under a reflux with 1.25 g. FeCl_3 in a little H_2O gives quant. the *azo compound*, orange needles, m. 145-6°. Although **E** is unchanged by day's boiling with alc., if half of the alc. is replaced by AcOH the soln. remains clear on cooling and on evapn. in a desiccator over lime and cautious addition of H_2O it yields *o*-acetocresol *p*-bromophenylhydrazone (**F**), identical with a product obtained from the ketone and the hydrazine boiled 0.5 hr. in alc. AcOH, stout, faintly yellow prisms from AcOH, m. 185-6°. In one case, **A** and 2 parts free β -O₂NC₆H₄NNHN₂ (**G**) in alc. heated some hrs. at 30-40° and allowed to stand overnight gave yellow crystals sepg. from benzine- C_6H_4 in strongly yellow prisms, m. 125-6°, which, however, when dissolved in C_6H_4 and evapd. now m. 158°; in all subsequent

expts. was obtained *β-p-nitrophenylhydrazinoisobutyl p-cresyl ketone*, stout brownish yellow prisms from C_6H_6 rubbing to a light yellow powder, m. 158°, loses no G on gentle warming with HCl, is resinsified by stronger heating, is unchanged by boiling 1 day in alc. with excess of G; $FeCl_3$ in boiling alc. at once oxidizes it to the *azo compound*, orange-red prisms from petr. ether, m. 76–7°, which is converted quant. by boiling 3 hrs. with somewhat more than 1 mol. G.HCl in aq. alc. into the *p-nitrophenylhydrazone*, dark red crystals, m. 213–5°. When A and 2 mols. free G were boiled 3 hrs. in alc. and allowed to stand overnight the soln. remained clear but on long boiling deposited crystals, which after repeated crystn. from Me_2CO -H₂O m. 222–3° and, when mixed with 5,2-Me(HO)C₄H₃C(:NNHC₆H₄NO₂)Me (which m. 246–7°), m. 230°, and hence they probably consisted of the latter compd. In a second expt., in which an equal vol. of AcOH was added to the alc., the product was so resinsified that no definite substance could be isolated. A in aq. alc. with 2 mols. G.HCl at 30–40° gives in the course of a few days the *p-nitrophenylhydrazone* (H), brownish red, flat needles from benzine- C_6H_6 , forming an orange-yellow powder, m. 163–7°. If the soln. of A and G.HCl is boiled there begins in about 15 min. an abundant sepn. of fine yellow needles, m. 210–1°. In a second expt., the mixt. was heated 2–3 hrs., filtered from the yellow crystals, m. 210–1°, and again boiled some hrs. whereupon a second crop of red crystals, m. 202°, sepd. The first compd. is probably *5,5-dimethyl-1-p-nitrophenyl-3-p-cresyl-pyrazoline* (I) and the second is *2,2,6-trimethylchromanone p-nitrophenylhydrazone* (J). H is unchanged by several hrs. boiling with alc.; if 3 drops concd. HCl is added to the alc. I is formed after 2 hrs. boiling, also if H is merely moistened with alc. and then heated with HCl or if H is allowed to stand 1–2 days or several weeks in Me_2CO containing a little NaOH. On the other hand H boiled with AcOH gives sometimes I, sometimes J. A, I and J are unchanged by long boiling with AcOH. C. A. R.

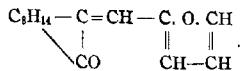
Transformation of phenol into cyclohexanol. G. VAVON AND J. DETRIE. *Compt. rend.* 172, 1281–3 (1921).—PhOH on reduction with H and Pt black is converted to cyclohexanol (A) and cyclohexanone (B) (Willstätter, *C. A.* 6, 2613). V. and D. find that ca. 66% of the PhOH is transformed into A and that the yield is but slightly influenced by varying the temp., nature of the solvent, concn., the quality and quantity of the Pt. If the hydrogenation is stopped before its completion, B can be sepd. from the products through its bisulfite compd. B can be quant. detd. by treating it with an excess of piperonal and Et₂ONa and weighing the *dipiperonylidene cyclohexanone* formed. The amt. of B found in the product is dependent mainly on the degree of hydrogenation but is also influenced by the activity and quantity of the Pt and the solvent used. In AcOH, a max. of 35% yield of B was obtained by operating with a large quantity of the catalyst. The presence of the OH group exerts a strong accelerating influence on the velocity of hydrogenation of the ring, this influence disappearing when the OH has been blocked by combining with other groups. The fact is shown by the following exptl. results. The figures denote the time in min. required to fix 1 l. H when 10 g. of the compd. in 50 cc. AcOEt are reduced in the presence of 1 g. of Pt black: PhOH, 15; PhOMe, 36; PhOEt, 86; PhOBu, 700; AcOPh, 55; C_6H_6 , 33; PhMe, 61. In the hydrogenation of PhOH, the mechanism of the reaction seems to be $PhOH \rightarrow B \rightarrow A$ rather than $PhOH \rightarrow A+B$.

A. T. FRASCATI

α-Pinene hydrobromide and the composition of French oil of turpentine. M. PARISEILLE. *Compt. rend.* 172, 1496–9 (1921).—Darmois has concluded (*Thesis*, 1910), that this oil contains 62% α-pinene and 38% β-pinene, having the optical rotations, resp., of –44.4° and –22.6°. P. has sepd. these constituents by fractional distn. and detd. a number of their physical properties. Thus, for α-pinene b. 153.5–4.5, d₄ 0.8748, n_D^{13} 1.4690, and $[\alpha]_D^{15}$ –43.48°; and for β-pinene b. 163–4°, d₄ 0.8848, n_D^{13} 1.479, and $[\alpha]_D^{15}$ –19.80°. Assuming β-pinene to be a pure d-form, P. has calcd. the rotation of d-α-

pinene as 48.80°. There is also involved the assumption that both give the pure *d*-isobornyl bromide. P. has found that the action of Br on pinene gives a mixt. of addition and substitution products even when no HBr is evolved. O. B. H.

Furfuralcamphor and some of its derivatives. MLLÉ. WOLFF. *Compt. rend.* 172, 1357-60.—Furfuralcamphor: 150 g. camphor in 400 g. C_6H_6 are refluxed out of contact with air with 40 g. $NaNH_2$ until the odor of NH_2 disappears, redistd., treated with 96 g. dry furfural in an equal vol. of C_6H_6 , heated on a water bath, and the distd. liquid is washed several times with water, dried over $CaCl_2$, and redistd. Most of the product b.p. 171-5°, mm. giving yellowish crystals m.p. 64°, very sol. in ether, alc. and C_6H_6 but only slightly sol. in petr. ether. Analysis and properties point to the formula



Reduction may be carried to the tetrahydro compd. The following derivs. were prep'd.: phenyl-, benzyl-, *p*-tolyl-, and *p*-anisylfurylcamporphormethane as well as furylarylcamporphormethane. H. W. POST

Molecular refraction and the specific rotatory power of furfuralcamphor and of some of its derivatives. MLLÉ. WOLFF. *Compt. rend.* 172, 1404-5 (1921).—The mol. refractions of furfuralcamphor, tetrahydrofurfurylcamporphormethane, phenylfurylcamporphormethane, benzylfurylcamporphormethane, tolylfurylcamporphormethane, anisylfurylcamporphormethane were detd. in $PhMe$ soln. (0.1 to 0.3 N) at temps. from 23.2° to 24.7°. The sp. rotatory powers were also detd. at temps. from 18° to 24°. A table of these is given.

E. P. WIGHTMAN

Action of sodiammonium on diphenylmethane, fluorene and indene. Dimethylfluorene. P. LEBEAU AND M. PICON. *Compt. rend.* 173, 84-6 (1921).—Sodiammonium (A) reacts with Ph_2CH_2 (B), fluorene (C) and indene (D) to form Na derivs., with simultaneous hydrogenation of B, C and D. A reacted very slowly with B in the autoclave at ordinary temp. In 10 days the yield of Ph_2CNa was only 8%. Disodium fluorene (E), from A and C in the autoclave at ordinary temp., washed with Et_2O and the NH_3 evapd., a yellow white solid (*Ber.* 34, 1659 (1900); 41, 2913 (1909)). Dimethylfluorene (F), from E and excess MeCl in liquid NH_3 , m. 95-6°, b_{20}^{25} 286.5°; yield 80%. Tetrahydrodimethylfluorene, from A and F, b_{20}^{25} 280-1°, b_{20}^{25} 148-9°. Indene dihydride, from A and D in liquid NH_3 in the autoclave at ordinary temp., the NH_3 evapd., extd. with petr. ether, b_{20}^{25} 177-8°; yield 50% (*Ber.* 23, 3276 (1890); *C. A.* 5, 3069). The petr. ether residue contained the Na deriv., but the investigation was not continued. C. C. D.

Aromatic acylamines as azo components (preliminary communication). W. KÖNIG AND K. KÖHLER. Techn. Hochschule Dresden. *Ber.* 54B, 981-7 (1921).—With the object of obtaining further exptl. evidence on the problem of the mechanism of the coupling reaction of diazo compds., K. and K. have started from the observation of Witt (*Ber.* 27, 2370 (1894)) that the α -naphthylamides of $PhSO_3H$ can couple with benzenediazonium salts in alk. soln., *i. e.*, behave like phenols. This observation has been confirmed by the prep'n. of analogous azo dyes from diazotized p - $O_2NC_6H_4NH_2$ and α - and β - $C_6H_4NHSO_3C_6H_4Me$; the analogy of these compds. with the corresponding naphthols is shown by their parallel anhalochromic phenomena. (By "anhalochromism" is meant, in analogy with "cathalochromism" (usually called simply halochromism) where a cation is the source of color, that deepening of color which is produced as the result of salt formation between a pseudo acid and a metallic hydroxide, *i. e.*, where an anion exists in the "chromic state," characterized by changed relationships in the unions.) The colors of these azo compds. show that the arylsulfonamide group is not as powerful an auxochrome as HO . In order to det. whether in the formation of these

dyes the sulfonamide reacts only in the tautomeric sulphenol form, $C_{10}H_7N \cdot S(O)(OH)R$, attempts were made to couple both α - and β - $C_{10}H_7NMeSO_2C_6H_4Me$ under various conditions but without success, thus confirming the view now generally prevalent that only enoloid and not ketoid forms of tautomeric substances are capable of coupling. From the very beginning of the chemistry of azo compds. to the present time it has been a dogma that acylation of aromatic amines completely destroys their ability to couple, but K. and K. have now found in 2 cases (α - $C_{10}H_7NHAc$ and α - $C_{10}H_7NHBz$) that this is not true; that this had not been observed before is due to the slowness with which the coupling takes place. From the data now at hand the different auxochromes fall into the following order of decreasing power: HO, $NHSO_2C_6H_4Me$, $NHBz$, $NHAc$. In what form the acylamines react in the coupling process cannot at present be stated with exactness; by analogy with the conditions holding in the case of the arylsulfonamides it may be assumed, with great probability, that the acylamines also react in the enolic form $C_{10}H_7N \cdot C(OH)R$. *4-p-Nitrobenzeneazo-1-p-toluenesulfonylaminonaphthalene*, obtained in good yield from p - $O_2NC_6H_4N_2Cl$ and $NaOAc$ added to an equiv. amt. of α - $C_{10}H_7NHSO_2C_6H_4Me$ in somewhat more than the calcd. amt. of N KOH, dark brown-red cryst. ppt., changed to orange by $AcOH$, from which it seps. in brick-red needles, m. 210°. *1-p-Nitrobenzeneazo-2-p-toluenesulfonylaminonaphthalene*, long, brick-red needles, m. 204°, rather difficultly sol. in alc. with yellow color. *1-p-Toluenesulfonylmethylaminonaphthalene*, obtained in 80% yield from α - $C_{10}H_7NHSO_2C_6H_4Me$ in somewhat more than the equiv. amt. of KOH shaken with the calcd. amt. of Me_2SO_4 and finally boiled a short time under a reflux, pearly leaflets from alc., m. 124-5°. From 2 g. α - $C_{10}H_7NHAc$ in 50 cc. $AcOH$ and 10 cc. H_2O and 25 cc. 0.4 N p - $O_2NC_6H_4N_2Cl$ (toned down with $NaOAc$) allowed to stand about 8 days in the ice chest is obtained 0.8 g. *4-p-nitrobenzeneazo-1-acetylaminonaphthalene*, brown-red needles from $AcOH$, m. 285-6°, characterized by a ruby-red anhalochromism which appears when the red-yellow alc. soln. is treated with concd. $NaOH$; an identical product was obtained by boiling $O_2NC_6H_4N \cdot NC_10H_8NH_2$ a long time with Ac_2O or treating it in C_6H_5N with 1 mol. $AcCl$. *Benzoyl analog* (0.2 g. from 2 g. $C_{10}H_7NHBz$ in 160 cc. $AcOH$ + 20 cc. H_2O and 20 cc. of 0.4 N $O_2NC_6H_4N_2Cl$ after 8 days in the ice chest), brown-red needles from $AcOH$, m. 214-5°, sol. in alc. with orange-yellow color changed to red-violet by $NaOH$. C. A. R.

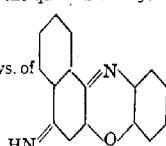
The rational nomenclature of the naphthol-, naphthylamine-, and aminonaphthalenic acids. E. DE BARRY BARNETT. *Chem. News* 123, 33 (1921).—Short names for these acids are formed by numbering the positions in the $C_{10}H_8$ nucleus 1-8 for SO_3H , α - θ for NH_2 and α - θ for OH. Thus "2-aminonaphthalene-6-sulfonic acid" would become *b.6* acid, and "1,8-aminonaphthal-3,6-disulfonic acid" would become *a. h. 3.6* acid or *a. 9.8.6* acid.* [Using the *C. A.* system of numbering, in which the SO_3H groups receive the lowest numbers, these 2 names would become, resp., *f.2* acid and *d.e.2.7* acid.—Anschr.] * AUSTIN M. PATTERSON

Transformation of metallic compounds of tautomeric substances as an unsolved problem. WILHELM WISLICENUS. Tübingen. *Z. angew. Chem.* 34, Aufsatzeil, 257-61 (1921).—A lecture. C. J. WEST

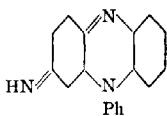
Constitution and color. VII. Theory of the quinoid organic onium salts. F. KEBERMANN. *Helvetica Chim. Acta* 4, 527-37 (1921); *cf. C. A.* 12, 2565.—K.'s earlier work (*cf. C. A.* 4, 2130), in which he concluded that the facts regarding the basic dyes, especially the azonium, oxonium, thionium and carbonium salts, were best represented by the *quinoid-onium* structures, having been brought into question by the subsequent efforts to eliminate entirely the quinoid concept, he calls attention to the fact that the quinoid theory is not necessarily incompatible with Werner's ideas and that efforts should be made to bring them together so that all the facts may be explained. He points out that Werner's theory is applied chiefly to the salt-forming function and does

not go sufficiently into the finer details of structure within the basic complex. This latter is exactly the field of the quinoid theory. K. brings out this point with 2 typical

examples: (1) salts and derivs. of



, and (2) salts and derivs. of



O. B. H.

Protecting fused materials with flue gases (U. S. pat. 1,379,619) 13. Chemico-crystallographic notes (STEINMETZ) 2. Recovery of solvent vapors (U. S. pat. 1,381,002) 13. Manna and extractions of mannitol (SCARLATA) 17.

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Methanol from methane. E. H. RIESENFIELD. U. S. 1,379,362, May 24. CH_3Cl , which may be obtained by chlorinating CH_4 , is converted, in anhydrous alc. soln., into Me_2O by heating under pressure with caustic alkali and the Me_2O is subsequently hydrolyzed under pressure in the presence of free acid to promote the hydrolysis.

Thymol from nitrocymene. R. M. COLE. U. S. 1,378,939, May 24. Thymol is prep'd. by electrolytic reduction of nitrocymene and diazotization and reduction of the resulting 1-methyl-2-amino-4-isopropyl-5-hydroxybenzene.

Nitrating benzene. T. J. BREWSTER. U. S. 1,380,185, May 31. C_6H_6 is nitrated by the action of HNO_3 in the presence of a Hg compd. such as the nitrate, which serves as a catalyst. Portions of the mixt. are continuously withdrawn and cooled to effect crystn., the crystals of dinitro- or trinitrophenol are filtered out and the filtered liquid is concd. and returned to the reaction vessel.

Picric acid. T. J. BREWSTER. U. S. 1,380,186, May 31. Picric acid is prep'd. by sulphonating phenol, cooling to about 50° , nitrating to the mononitro stage by adding HNO_3 slightly in excess of that required for the introduction of one NO_2 group while maintaining the temp. below 70° , and then nitrating to the trinitro stage by adding more HNO_3 and allowing it to react at a higher temp.

Reaction of oxalic acid on turpentine. W. B. PRATT. U. S. 1,380,414, June 7. Oil of turpentine or pine oil is heated with hydrated oxalic acid to a temp. of about 140° or higher and the acid is sepd. from the reaction product by crystn. in order to produce a product suitable for fractional distn. which yields light products useful as solvents of grease, paint or other substances.

Ethyl ester of stearoricinate diiodide. F. BOEDECKER. U. S. 1,381,057, June 7. A cryst. ethyl ester of stearoricinate diiodide is formed by treating stearoricinate with aq. HOAc and I and esterifying the diiodide thus formed with EtOH and HCl. The ester forms needles, m. 31°, is insol. in H₂O but sol. in org. solvents.

Salicylaldehyde and salicylic acid by oxidation of *o*-cresol. J. M. WRISS and C. R. DOWNS. U. S. 1,380,277, May 31. Vapor of *o*-cresol is passed over a catalytic metal oxide, *e.g.*, Mo oxide on crushed pumice, at a temp. of about 250–500° together with air to effect its oxidation with formation of salicylaldehyde and salicylic acid.

11—BIOLOGICAL CHEMISTRY

HATTIE L. HEFT, EDGAR G. MILLER, JR. AND WILLIAM J. GIES

A—GENERAL

FRANK P. UNDERHILL

The law of Arrhenius in relation to the rule of the temperature coefficient. GEORGES MATISSE. *Arch. intern. physiol.* 16, 461–6(1921).—A semi-mathematical and biological discussion concluding with the opinion that Arrhenius' law alone is the true expression of the acceleration of chem. processes as a function of temp. and alone should be used. F. S. HAMMETT

Studies on urease. STURE LÖVGREN. *Biochem. Z.* 119, 215–93(1921).—A running review of the literature on urease of unusual completeness is given in this study. The expts. reported by L. lead him to conclude that the so-called co-enzyme for urease activity in blood serum is nothing more nor less than a *pH* effect. A study of Van Slyke's formula for the action of soy-bean urease (*cf. C. A.* 9, 89) showed that it is not valid at least for fresh enzyme solns. and at the opt. *pH* = 7. Moreover L. claims that the values for C in the formula are erroneously calcd. The favoring H-ion concn. for the enzyme action is not independent of the substrate in the case of the soy-bean urease, but each urea concn. has (under otherwise unchanged conditions) its particular *pH*-optimum. This is not an insignificant difference because the optima are scattered over a unit range of *pH*. From the fact that the relation between the urea concn. and the *pH* optimum is a straight line equation, it is evident that even during the reaction there takes place a disturbance in the *pH* optimum with decreasing substrate concn. The *pH* sensitivity of the urease is also dependent on the substrate concn. At the intermediate urea concn. of 0.2 M it is at a minimum. The formula $K_1 = a/t \log [a/(a-x)]$ is considered as probably a better expression of urease activity, though it is not claimed that it is valid for the whole course of the reaction. F. S. HAMMETT

Chemical and physicochemical researches on hemocyanin. I. The index of refraction of hemocyanin. G. QUAGLIARIELLO. *Arch. sci. biol.* 1, 246–58(1920); *Physiol. Abstracts* 6, 12–3(1921).—The index of refraction of aq. solns. of hemocyanin bears a direct relation to the concn. of that compd. “It may be expressed by the formula $(n - n_0)/C = k$, in which n is the refractive index of the soln., n_0 that of the solvent, C the percentage concn. of the hemocyanin, k a const. (the sp. refraction of hemocyanin).” When 1 g. of hemocyanin is dissolved in 100 cc. of water or of a soln. of an acid, base, or salt, the refractive index is increased by 0.00197. Knowing the refractive index of the solvent, the exact % of hemocyanin present in a soln. may be detd. by means of the formula, provided its concn. does not exceed 2%. In the range of temp.

10° to 30°, the value of $n - n_0$ is not influenced by the temp. II. Colloidal properties and isoelectric point of hemocyanin. G. QUAGLIARIELLO. *Atti. accad. med. chir. Napoli* 74(1920); *Physiol. Abstracts* 6, 12-3(1921).—On dialysis of its soln., hemocyanin soon began to ppt.; pptn. was finally complete, but a period of dialysis of approx. 30 days was required. These phenomena indicated that hemocyanin is a globulin rather than an albumin. Since hemocyanin pptd. as soon as it became neutral, it could not be obtained in the so-called "neutral" form, *i. e.*, coagulable by heat and by alc., but not pptd. by a trace of CuSO_4 . After a period of dialysis, hemocyanin (in approx. 1% soln.) was no longer pptd. by either heat or alc. Hemocyanin was partially pptd. from blood by simple diln. with distd. water; was partially, but not completely, pptd. from its solns. by NaCl and Na_2SO_4 ; and was completely pptd. by MgSO_4 or $(\text{NH}_4)_2\text{SO}_4$. In an elec. field, dialyzed hemocyanin acted as an amphoteric electrolyte, but its acidic tendencies were greater than its basic tendencies. Its minimum solv. corresponded to its isoelectric point. JOSEPH S. HEPBURN

May the terms osmotic value, osmotic pressure, turgor pressure and suction force be used as synonyms? A. URSPRUNG AND G. BLUM. *Biol. Zentr.* 40, 193-216(1920); *Physiol. Abstracts* 5, 506(1921).—In addition to the osmotic value with normal vol., U. and B. recognize the osmotic value in limiting plasmolysis (*i. e.*, the concn. of a soln. of sucrose, KNO_3 , or other compd. which just produces plasmolysis), and the osmotic value in water saturation (*i. e.*, the value calcd. on the vol. of the cell satd. with water). The osmotic pressure is the pressure in atm. exerted on the wall by the osmotically active cell contents. Turgor pressure is the total internal pressure in atm. exerted on the wall. Wall pressure is the pressure in atm. exerted by the wall on the cell contents; it is numerically equal to the turgor pressure. The suction force of the cell is the force with which the cell absorbs water. The suction force of the cell contents is the force with which they absorb water. The bleeding force of the cell is the force with which water is expressed. The suction force of the cell is equal to the suction force of the cell contents minus the pure wall pressure. JOSEPH S. HEPBURN

Erroneous biological theory of the Brownian movement. F. OCARANZA. *La Semana Med.* 27, No. 1380(1920); *Physiol. Abstracts* 5, 383(1920).—Polemics against the so-called *Micrococcus brownianus*. JOSEPH S. HEPBURN

Do the lipoids neutralize antithrombin? ANDRÉ GRATIA. *Réunion soc. belge biol.* 1920, 129-30; *Physiol. Abstracts* 5, 406(1920).—Lipoidal cytozyme of the blood platelets and tissues combines with the serozyme of the plasma in the presence of Ca ions to form thrombin. If a small portion of plasma be prevented from coagulating by the addition of 1 drop of hirudine soln., it will coagulate rapidly if 1 drop of a sufficiently concd. emulsion of lipoidal cytozyme be also added. However this neutralizing action is not chem.; if 2 drops of hirudine soln. be used, 4 or 5 drops of cytozyme emulsion are required; and, if 3 drops of hirudine soln. be used, the plasma will remain liquid indefinitely regardless of the amt. of cytozyme added, but it may then be coagulated in less than 5 min. by the addition also of a small amt. of serum rich in serozyme. Moreover, an amt. of cytozyme more than sufficient to neutralize completely a given amt. of hirudine in normal plasma rich in serozyme does not have this action when the plasma has been deprived of its serozyme by adsorption with $\text{Ca}_3(\text{PO}_4)_2$. The conclusion is drawn that lipoidal cytozyme does not directly neutralize antithrombin, but exerts its action by direct union with serozyme, and thereby overcomes the resistance due to antithrombin. JOSEPH S. HEPBURN

Mode of combination of thrombin and antithrombin. ANDRÉ GRATIA. *Réunion soc. belge biol.* 1920, 131-2; *Physiol. Abstracts* 5, 407(1920).—G. does not accept a chem. combination of thrombin and antithrombin in definite proportions. The reaction is comparable to that between antigen and antibody. JOSEPH S. HEPBURN

Application of physical methods to physiology. A. V. HILL. Univ. Manchester. *Science Progress* 16, 79-89 (1921).—A discussion of the influence exerted upon physiology by recent work in physics and in biological, colloidal, and physical chemistry.

JOSEPH S. HEPBURN

Tetradon poison and some of its chemical characteristics. F. ISHIHARA. *Tokyo Igakukai Zasshi* 31, No. 23, 1-39 (1917); *Jap. Med. Literature* 5, 21 (1920).—The poison was extd. from eggs of the globe fish, and was purified by repeated pptn. in abs. alc. The product was a tasteless white powder, sol. in water, and neutral in reaction. It gave negative reactions for protein and alkaloids, and with the murexide test. It contained S, and an NH₂ group, and gave positive reactions for creatinine and with ninhydrin. The poison was decompd. by the action of pepsin in 8 hrs., and was destroyed in *N* solns. of NaOH or KOH, but was not affected by sunlight, trypsin, emulsin, invertase, or bile, or by boiling for 4 hrs. It was destroyed by boiling for 6 to 9 hrs. While it resisted the action of mineral acids, it was destroyed by boiling for 1 hr. with 1 : 10 HCl. The poison was dextrorotatory, and possessed from 26% to 36% of the power of *d*-glucose to reduce Cu solns.; it was not fermentable, but became so after inversion with acids. Crystals of phenylglucosazone (recognized by their morphology and the m. p.) were obtained by boiling the poison for 1 hr. with phenylhydrazine or by treatment with that base at room temp. after inversion. The poison yielded typical crystals of glucose benzoate on treatment with BzCl in alk. soln. The characteristic reactions of glucose were obtained with the poison, more readily after inversion than before. The poison gave negative reactions for pentose, lactose, glucuronic acid, (naphthoresorcinol test), inosite, formose, glucosamine, and glyoxin. The conclusion is drawn that glucose is a constituent part of the poison and not an admixed impurity, and is probably present as a glucose ester rather than as a glucoside. J. S. H.

The mechanism of the action of ultra-violet light rays on the cell. SERGE TCHAHOTINE. *Ann. inst. Pasteur* 35, 321-5 (1921).—Ultra-violet light rays effect in the sea urchin a pptn. of colloids which increases permeability, enabling the salts of the medium to penetrate and ppt. further the protein which encloses colloidal lecithin drops. The latter liberate a base, choline presumably, which produces OH ions, causing in turn a swelling of the colloidal mass.

E. R. LONG

The sugar of the blood. J. J. R. MACLEOD. *Physiol. Reviews* 1, 208-38 (1921).—A review.

E. R. LONG

The influence of various circulatory conditions on the relation to the low oxygen of rebreathing. E. C. SCHNEIDER AND DOROTHY TRUESDELL. Dept. Physiol., Med. Research Lab., Air Service, U. S. A. *Am. J. Physiol.* 56, 241-8 (1921).—Ten special groups were selected from 2000 cases examd. on the basis of various circulatory factors, e. g., (1) high systolic pressure, (2) low systolic pressure, (3) high diastolic pressure, etc. and the av. ability of the group to withstand low O₂ pressures, as detd. by the rebreathing test compared. The data show the circulatory factor basis of selection does not sep. men that differ in ability to compensate to low O₂.

J. F. LYMAN

Respiration and circulation in the cat. I. The influence of acute anoxic anoxemia on respiration and circulation. V. DOR. Cambridge. *J. Physiol.* 55, 43-9 (1921).—In cats under urethan anesthesia O₂ absorbed per min. is practically const. for different O₂ pressures of breathing air. CO₂ output slightly increases and total respiratory vol. per min. increases with low O₂. Percentage satn. of oxyhemoglobin, both in arterial and in venous blood, decreases, so that the difference of O₂ content in arterial and venous blood is practically const. The min. vol. of blood passing through the lungs undergoes no marked change when air of lower O₂ pressure is breathed. Pulse rate increases, but the output of each beat decreases.

J. F. LYMAN

Effects on the frog heart of varying the alkalinity and calcium content of the per-

fusing fluid. W. BURRIDGE. Univ. London. *J. Physiol.* 55, 111-13(1921).—The effect of Ca on the frog heart depends, within certain limits, on the p_{H} of the perfusing fluid and *vice versa* the effect of p_{H} depends on the concn. of Ca. J. F. LYMAN

The regulation of the water content of the human organism. E. F. ADOLPH. Oxford. *J. Physiol.* 55, 114-32(1921).—“No single substance will change the body's regulation of water content, though all of them are necessary for its maintenance. Water is lost upon a diet free of chloride for the same reason that it is lost on a N-free diet. The water is related to the whole of the body's constituents; it is a part of the body's almost immutable structure.” The content of water may be raised by introducing a temporary store of salt or carbohydrate; this water is not a part of the essential structure of the body. Other than this, no evidence was obtained of a reserve of “free” water. J. F. LYMAN

Anticoagulating action of nucleic acid from pancreas. Stability and characters of the plasma nucleate. DOYON. *Compt. rend.* 172, 134-5(1921); cf. following abstract.—The anticoagulating action of the nucleic acids shows the participation of the cell nuclei in the phenomena of secretion and more particularly the nucleic origin of the internal secretion (antithrombin) which maintains the fluidity of the blood. Nucleic acids were extd. from beef pancreas by the method of Neumann, and purified by repeated washing in alc. and Et₂O, then dried in a vacuum. Of the acid thus prep'd., 0.105 g. was dissolved in 15 cc. of a soln. contg. 4 g. NaCl and 5 g. Na₂CO₃ in 1000 H₂O. The acid dissolved even in the cold but its soln. is hastened by warming a little on the water bath. The reaction of the soln. was clearly acid to litmus. Sixty g. of blood, directly from the carotid of a dog, were added to the acid soln., the mixt. was agitated long and vigorously, then immediately centrifuged at high speed when a perfect sepn. of the plasma from the red and white cells occurred without a trace of hemolysis. Small tubes were prep'd. as follows: Nos. 1 and 2 contained 4 cc. plasma and 15 or 20 drops of dog serum, 3 and 4 contained 4 cc. of plasma and 15 or 20 drops of a 10% soln. of CaCl₂, 5 and 6 contained plasma, serum, and CaCl₂ in amts. indicated and No. 7 plasma alone. Samples 5 and 6 coagulated in less than 10 hrs.; 7 coagulated incompletely in 7 days; 1, 2, 3, and 4 remained liquid but showed small flocks of fibrin which slowly united. On heating the nucleated plasma after the sepn. of the cells the fibrinogen coagulated between 56 and 58°. L. W. RIGGS

Employment of chloroform for the preparation of nucleo proteins and of nucleic acids active in vitro on the blood. Complexity of the action of nucleic acids in vitro. DOYON. *Compt. rend.* 172, 1212-4(1921); cf. *C. A.* 15, 1156, 1165.—In order to prep. free active nucleo proteins from organs other than the liver of dogs or cats, it is necessary to submit such organs either to putrefaction, or a temp. of 110-120° in the autoclave, or to autolyze in the presence of CHCl₃, or subject to chloroformic dialysis in a vacuum. The preferable method for obtaining very active thymonucleic acid consists in subjecting the thymus to autolysis in the presence of CHCl₃ before applying the process of Neumann. Thus 280 g. of hashed thymus, 800 g. H₂O and 50 g. of CHCl₃ were allowed to autolyze 8 days, when about 2 g. of an active acid contg. 10.7% of P were obtained. Injected intravenously in the dog the nucleic acids have a more complex action than *in vitro*. They provoke the secretion by the organism of an anti-coagulating nucleo-protein, after the manner of peptone, atropine or morphine, and also induce narcosis, vaso-dilatation and reduced arterial pressure. These phenomena resemble those caused by the action of the bile which is the best agent to excite the secretion of bile. Two tests with dogs are reported in detail. (Cf. preceding abstract.) L. W. RIGGS

Measurement and standards of basal metabolism. FRANCIS G. BENEDICT. *J. Am. Med. Assoc.* 77, 247-50(1921).—The technic, measurements, interpretation of results, and standards are discussed. “The use of a so-called ‘standard’ or ‘normal’

metabolism is fraught with considerable danger and the interpretation of metabolism results is not a simple rule-of-thumb procedure. In fact the interpretation of results now far exceeds in complexity the actual lab. technic. The technical stumbling blocks to the advancement of metabolism studies in clinical medicine have, we believe, been overcome. The great intellectual stumbling block, namely, lack of education with regard to the significance of metabolism measurements, cannot be overcome by the efforts of any one lab., one school, or one teacher. Before using gaseous metabolism measurements, it behooves every physician to familiarize himself thoroughly with the fundamentals of gaseous metabolism and its significance." *I. W. RIGGS*

Fundamental ideas regarding basal metabolism. *GRAHAM LUSK. J. Am. Med. Assoc.* 77, 250-2(1921).—L. gives an interesting historical sketch of the ideas on the relation of heat loss and body surface area. Especial reference is made to the recent work of Dubois, of Benedict and Harris, and of Dreyer. *L. W. RIGGS*

Enzyme chemistry, its aims and accomplishments. *H. v. EULER. Svensk Kem. Tid.* 33, 37-45(1921).—An address. The subject matter is available in the author's book on enzymes (German). *A. R. R.*

Invertase. *OLOF SVANBERG. Svensk Kem. Tid.* 33, 58-66(1921).—An address. The subject matter is available in H. v. Euler's book on enzymes. *A. R. R.*

Adsorption of odorous molecules on the surface of solids (ZWAARDEMAKER) 2.

FISCHER, MARTIN H.: Soaps and Proteins. Their Colloid Chemistry in Theory and Practice. New York: John Wiley and Sons, Inc., 432 Fourth Ave. 272 pp. \$4. net.

PHILIP, JAMES CHARLES: Physical Chemistry, its Bearing on Biology and Medicine. 2nd ed. London: E. Arnold. 326 pp. \$2.75.

WARD, DELANCEY WALTON: Handbook of Chemical Experiments for Dental Students. 5th ed. New York: D. Van Nostrand Co.

B—METHODS AND APPARATUS

STANLEY R. BENEDICT

A constant-temperature bath for heating blood serum. *R. R. HENLEY. Bur. of Animal Industry. J. Agr. Research* 21, 541-4(1921).—A bath is described for heating clear anti-hog-cholera serum to a temp. of 58-60°. The operation of the bath depends on the utilization of the vapors of a liquid having a b.p. at or about 61° as the heating medium. A diagram of the bath is shown and specifications are given. *F. C. COOK*

Determination of albumin in urine. *ARCEO ANGIOLANI. Giorn. farm. chim.* 69, 142-6(1920).—Twenty-100 cc. urine, according to the amt. of albumin indicated by a qual. test with dil. AcO_2H , are treated with 1 g. CCl_3COOH and heated to boiling. The pptd. albumin is filtered off, washed and transferred to a beaker. 50 cc. 0.4% KMnO_4 and 1 cc. concd. H_2SO_4 are added and the mixt. is boiled. 0.8% oxalic acid is then added from a buret until the ppt. just dissolves. Parts of albumin per mille = $(50 - V)/N$, where V = cc. $\text{H}_2\text{C}_2\text{O}_4$, and N = cc. urine. The method is only approximate and is not applicable to less than 10 mg. albumin. *A. W. DOX*

The chemical estimation of gastric function by the test meals of Ewald and Boas. *J. H. RYFFEL. Guy's Hospital. Lancet* 1921, I, 586-8.—Different indicators have been used to det. gastric acidity. Total acidity is usually detd. by titration with NaOH , with phenolphthalein as indicator. The earliest indicator for free HCl was that of Günzberg. This has been shown to give results comparable with those of physical measurements, but as the test involves evapn. it is not convenient for purposes of titration. Töpfer introduced dimethylaminonazobenzene, which has been widely used, but the region of change for this indicator lies between $N/1000$ and $N/10,000$ HCl , and the end-point as ordinarily employed about $N/5000$ HCl , which is distinctly too low

in the acid scale for a detn. of free HCl. Although the term "free HCl" in this connection is a misnomer, the indicator is of great utility, as org. acids produced by the Oppler-Boas bacillus and acid streptococci never attain either in the stomach, or in culture in the presence of sugar, an acidity great enough to affect dimethylaminoazobenzene, so that this titration is not affected by org. acids. Rolph purposed to use instead tropeolin OO, which reacts at $N/200$ HCl, while recently Cole and Adie have urged the use of thymol blue working to an end-point = $HCl \cdot N \times 10^{-2.6}$, or about $N/500$. This indicator would leave a large gap between the total acidity and the free HCl, so that it would surely be better to retain dimethylaminoazobenzene, and, in addition, add a suitable indicator to the filtrate to compare the tint obtained with a series of tubes contg. known quantities of HCl, so as actually to detn. the concn. of H ions present. B. Moore employed the rate of hydrolysis of AcOMe to det. the free HCl. The method is sound physically, but somewhat laborious. Willcox developed the detn. of a quantity of a different kind, the "active HCl." This is based on the method originally employed by Prout to demonstrate the presence of free HCl in gastric juice. It is essentially a detn. of the loss of Cl on ignition, and includes free HCl and HCl combined with proteins and other volatile bases. Active HCl corresponds closely with the result of titration of total acidity unless org. acid be present, when the difference between the two measures the org. acid. Graham pointed out that the estn. of mineral, or non-volatile Cl, which is involved in the estn. of active HCl, was itself of value, as this quantity was notably increased in carcinoma of the stomach and in regurgitation of duodenal contents into the stomach. In test meals of the type described there are two principal sources of error: If the stomach empties quickly, as it frequently does in cases of duodenal ulcer, a small amt. of material is obtained, which is rich in mucus, poor in toast, and contains HCl less than normal and a high mineral Cl. The remedy is to shorten the time so as to obtain a true sample of the meal. The o'ther source of error is that aspiration is liable to cause some bleeding; there the remedy is to insist on the examn. of the feces for blood in every case. If the blood in the test meal is due to trauma it will not be found in the feces. Spectroscopic examn. is also desirable. The fractional test meal gives results that are of great interest, but it serves rather for arranging the cases in various groups than for individual diagnoses.

E. B. FINK

The test for minute amounts of lactose in urine by the formation of formaldehyde.
KURT HERZBERG. *Biochem. Z.* 119, 81-92 (1921).—Various methods for the demonstration of small amts. of lactose in urine were tested with the result that the following procedure was found to be the most reliable. 10 cc. of clarified and deproteinized urine are mixed with 0.2 g. of phenylhydrazine acetate and 0.4 g. of Na acetate and heated for 20 min. on a water bath at the b. p. The mixt. is then slowly cooled and allowed to stand till the next day. The residue is filtered off through a small filter, washed twice with 10 cc. of cold H_2O and then dissolved in as little as possible (5 to 10 cc.) of hot H_2O . 2 to 5 cc. of the filtrate are treated with an oxidizing mixt. consisting of 40 cc. 1% $KMnO_4$ soln., and 100 cc. distd. H_2O , 60 cc. dil. H_2SO_4 (1 : 5) up to the point where a ppt. of MnO_2 remains after heating. After 5 min. this is decolorized with 3 drops of satd. oxalic acid soln. Then a pinch of peptone is added, the mixt. is warmed, 1 drop of 3% $FeCl_3$ soln. is introduced, and one half the vol. of concd. HCl is added. After boiling for one half min. the reaction is complete and yields a violet or lilac color. A positive reaction was never obtained in normal urine. The method is reliable in lactose concns. above 0.2%. H. was unsuccessful in completely pptg. from normal urine either by Hg acetate or phosphotungstic acid substances other than lactose which yield HCHO with $KMnO_4$. A reliable test is only given when the lactosazone is prep'd.

F. S. HAMMETT

Blood volume studies. V. The carbon monoxide method—Its accuracy and limitations. H. R. ARNOLD, E. B. CARRIER, H. P. SMITH AND G. H. WHIPPLE. Univ. Calif. Med. School. *Am. J. Physiol.* **56**, 313-27(1921).—A critical study of the method. It is concluded that the method is reasonably accurate for measuring the *hemoglobin*. The *circulating hemoglobin* of the blood makes up from 90% to 95% of the total body hemoglobin. It is incorrect to calc. total blood vol. from the red cell hematocrit because the ratio of cells to plasma is not a const. in all parts of the body. The CO method is, therefore, not accurate for the detn. of *plasma* vol. **VI. Plasma volume as determined by hemoglobin injection.** F. W. LEE AND G. H. WHIPPLE. *Ibid* 328-35.—The hemoglobin method for plasma vol. is in principle exactly like the vital dye method. The hemoglobin method is reasonably accurate for detg. the *circulating* blood plasma, but it gives no direct information concerning red cell or hemoglobin vol. The hemoglobin injected is removed completely from the blood within 18 hrs. and is without marked physiol. effects. The av. plasma vol. for dogs is 51.8 cc. per kg. body wt., but for large fat dogs it is lower, *viz.* 41.0 cc. per kg. **VII. Comparative values of Welcker, carbon monoxide and dye methods for blood volume determination. Accurate estimation of absolute blood volume.** H. P. SMITH, H. R. ARNOLD AND G. H. WHIPPLE. *Ibid* 336-60.—The dye or hemoglobin methods give the true *plasma* vol., the CO and Welcker's methods give the true body *hemoglobin* vol. By adding the two plus the vol. of white cells the true *blood* vol. is obtained. In dogs, plasma vol. is about 4.8 cc. per 100 g. body wt.; the hemoglobin vol. is about 4.2 cc. and the white blood cells about 0.2 cc., making a total blood vol. of about 9.2 cc. per 100 g. body wt. The error in calcg. blood vol. from hematocrit reading and plasma vol. or from hematocrit and hemoglobin lies in the fact that blood cells and plasma are not uniformly mixed in all parts of the circulating system. There is an excess of plasma over red cells in the arterioles and capillaries.

J. F. LYMAN

A micro-electrode and unicellular stimulation. I. H. HYDE. *Biol. Bull. Marine Biol. Lab.* **40**, 130-3(1921).—H. gives a description of a micro-pipet and electrode and of its method of use whereby it is possible to inject definite amts. of fluid, ext. special parts of cells, and electrically stimulate cells. Reference is made to the micro-pipet described by C. V. Taylor (cf. *C. A.* **14**, 2498).

L. W. RIGGS

Revolving tapis for the study of motion and of work. J. P. LANGLOIS. *Compt. rend.* **172**, 1447-9(1921).—A detailed description is given of an app. based on that of Benedict at Washington, but on which various improvements have been made.

L. W. R.

Source of error in tests for acetone. E. PITTARELLI. *Policlinico* **28**, 621(1921); *J. Am. Med. Assoc.* **76**, 1803.—P. found that rubber under the influence of steam or boiling water yields a volatile substance which responds to all the tests most characteristic of acetone; therefore conclusions based on technic involving distn. in the presence of rubber may be misleading.

L. W. RIGGS

Diazo test for bilirubin in blood. A. A. H. VAN DEN BERGH. *Presse Medcale* **29**, 441(1921); *J. Am. Med. Assoc.* **77**, 235.—This test is reliable in a concn. as low as 1 in 1.5 million and can be applied with as little as 0.25 cc. of clear serum. The rapid or delayed response shows further whether bilirubin in the blood serum is the result of obstruction or of impaired liver functioning. The reagent is made fresh with 25 cc. of a one per thousand soln. of sulfanilic acid, 15 cc. of concd. HCl, and 0.75 cc. of a 0.5% soln. of NaNO₂. The serum is treated with twice its vol. of alc. and the albumin centrifuged out. The supernatant fluid is taken up with a pipet and the reagent is added in the proportion of 25% by vol. The fluid turns red with a violet tinge in the presence of bilirubin.

L. W. RIGGS

Test for urobilin. E. PITTARELLI. *Riforma Medica* **37**, 492(1921); *J. Am. Med. Assoc.* **77**, 159.—P. recommends a test depending on the fluorescence of Zn uro-

bilinate as most practicable for estg. the urobilin content of the urine. For this, 2 parts urine are added to one part of the reagent, which is a mixt. of 100 cc. of a 2% soln. of $Zn(AcO)_2$ in MeOH; 5 g. each of AcOH and NH_4AcO , and 100 cc. amyl alc. The contents of the tube are gently mixed and are set aside for a few min., when fluorescence will testify to the presence of urobilin. A possible source of error is the presence of eosin in the urine, when eosin has been used for coloring foods, or disinfecting dishes.

L. W. RIGGS

Methods for close automatic control of incubating temperatures in laboratories. JOHN T. BOWEN. Bur. Animal Industry. U. S. Dept. Agr., *Bull. 951*, 1-16 (1921).—A description is given of the heating equipment, temp. control system and construction of the const.-temp. incubating rooms in the Bur. of Animal Industry.

W. H. ROSS

Significance of "lignin" color reactions. ERNEST C. CROCKER. *J. Ind. Eng. Chem.* 13, 625-7 (1921).—1,3,5-C₆H₃(OH)₃, *p*-H₃NC₆H₄NO₂ and other single reagent color tests for "lignin" serve as indicators for traces of an aldehyde that accompanies the lignin, not for any appreciable part of the lignin complex. Spectroscopic examn. indicates that there is one predominating color producing aldehyde in wood (possibly coniferyl aldehyde). Vanillin or furfural, if present, plays a subordinate role. C.'s work is in substantial agreement with the work of Czapek on "hadromal" (cf. *Z. physiol. Chem.* 27, 141 (1899)). A study of the Mäule reaction shows that it can possibly be used in distinguishing between deciduous and coniferous woods, since only the former appear to give a definite red color reaction. The reaction may therefore prove of service to the botanist. The ferriferricyanide test has little value as a lignin reaction. Several non-aldehydic materials, which give color reactions similar to those of lignin, have been shown to contain traces of aldehydes that are responsible for the colorations produced. Oil of clove and sassafras oil contain small amt. of an aldehyde that appears from spectrometric data to be identical with that found in wood, and which is probably distd. from the wood together with the essential oil. LOUIS F. WISE

Table for the determination of dextrose, invert sugar and levulose according to the thiocyanate-potassium iodide method (BRUHNS) 7. Modification in the Kossel-Netmann method for the determination of phosphorus in organic substances (MANCINI) 7.

C—BACTERIOLOGY

A. K. BALLS

A souring of beef caused by *Bacillus megatherium*. HUBERT BUNYEA. Bur. Animal Ind. U. S. Dept. of Agr., *J. Agr. Research* 21, 689-98 (1921).—This bacillus will sour beef under a wide range of temps. but not in the absence of O. Propionic acid is produced during the souring of beef by this organism. *B. megatherium* is non-pathogenic for rabbits and guinea pigs and does not produce an appreciable amt. of toxin when propagated upon raw beef. A description of this organism and of the comparative odor production of other organisms is given.

F. C. COOK

The use of alcohol-soap-paste for disinfecting the hands. A. KÖLLIKER. *Chem. Ztg.* 45, 649-50 (1921).—As a germicidal agent suitable for use in cleansing the hands in surgical work 70% alc. is very efficient, but it is inconvenient to transport, subject to change in concn., dangerous near fire, and liable to loss through breakage of containers, leakage and spilling. An alc.-soap-paste, contg. 20% of palmitic-stearic acid soaps and 80% of abs. alc., is free from these disadvantages. Under the name "Festalkol" it is supplied in glass tubes contg. enough for a single disinfection of the hands. Denatured alc. may be substituted for abs. alc. in its prepn.

W. C. EBAUGH

The etiology of bacillary dysentery in asylums. W. S. DAWSON AND W. MOODIE. *Lancet* 1921, II, 225-6.—The feces of all cases of clinical dysentery and diarrhea

should be examd. in the lab. In view of the fact that primary attacks and recurrences may be so slight as to pass unnoticed, and the possibility of every case remaining a chronic carrier, very strict observation and a system of permanent isolation are necessary in order to prevent the spread of the disease. Agglutinins are present in the blood of affected patients only after the 4th week of the disease, and therefore agglutination tests are of little diagnostic value.

E. B. FINK

Serological types of pneumococci in lobar pneumonia. A study of 100 cases. **FRED GRIFFITH.** *Lancet* 1921, II, 226-8.—There are 3 main antigenic components in the pneumococcus group; these 3 components appear to exist in a relatively pure condition in the 3 standard American types of the Rockefeller Inst. It is possible that if serums from unselected strains are used cross-agglutination between the 3 chief types and their respective serums may occur. Agglutinating serums prep'd. from horses appear to be less selective than rabbit serums.

E. B. FINK

Agglutinating power of thorium sulfate on the spores of *Aspergillus fumigatus* Fr. **A. SARTORY AND P. BAILLY.** *Compt. rend.* 172, 1257-8(1921).—In studying the agglutinating power of $\text{Th}(\text{SO}_4)_2$, in concns. of $1/100$ to $1/50000$, on homogeneous emulsions of the spores of *Aspergillus fumigatus* Fr., S. and B. established that the agglutination phenomenon is very distinct for concns. of $1/400$ — $1/1000$, very feeble for concns. of $1/200$ and dilns. above $1/1000$ and practically *nil* for very concd. solns. The agglutination is very rapid and reaches its max. at $1/1000$ — $1/2000$. In prep'd. the salt solns. double distd. H_2O must be used. The spore emulsions are prep'd. by mechanically agitating for 1 hr. 50 cc. double distd. H_2O and a 15-20 day culture grown on potato. After filtration, the $\text{Th}(\text{SO}_4)_2$ is added and the tubes are incubated at 37° . Examn. is made both macroscopically and microscopically. The floccules produced on agglutination are constituted of individual spores enveloped in fine reticulum, which, when the action is complete, fall to the bottom leaving the supernatant liquid clear. Expts. carried out identically with salts of La, Er, Yt, Nd and Pr gave negative results. Froutin and Mousalli have similarly observed that the bactericidal and agglutinating power of Th salts on *B. pyocyaneus* and *B. dysenteriae* was much greater than that of the other rare earths.

A. T. FRASCATI

Toxic substance obtained by growing hemolytic streptococci in a special medium. **LEON C. HAVENS AND MARGARET L. TAYLOR.** Johns Hopkins Univ. and Univ. Iowa. *Am. J. Hyg.* 1, 311-20(1921).—A sp. toxic substance was produced during the growth of certain strains of hemolytic streptococci upon the following medium: Ordinary meat infusion was made with distd. water; 1% peptone, 1% Na_2HPO_4 , and either 0.5% or 1% glucose was added; the H-ion concn. was adjusted between pH 8.0 and 8.2; the liquid was tubed and sterilized in an autoclave at a pressure of 10 lbs. for 10 min. A fragment of sterile rabbit kidney and 1 cc. of defibrinated sheep or rabbit blood were added to each tube. To obtain the best results this medium should be inoculated at once without incubation to determine sterility; contaminated tubes are detected and discarded as they appear. The sp. toxic product was filtrable; and the filtrates had a definite pathogenic action when injected into mice, rabbits, and guinea pigs. The toxic product possessed specific properties as an antigen; when rabbits were immunized with the toxic filtrates their sera gave protection both against infection with the cultures and against intoxication with the filtrates.

JOSEPH S. HEPBURN

Acquired tolerance of beer yeast for arsenic; mechanism of the acquired tolerance of microorganisms for toxic substances. **JEAN EFFRONT.** *Réunion soc. belge biol.* 1920, 99-101; *Physiol. Abstracts* 5, 437(1920).— As_2O_3 , in a concn. of 75 mg. per l., destroys yeast by producing a rapid autolysis. But, by a progressive increase in dosage, a tolerance may be attained which is 3 times greater than the normal lethal concn. The yeast, which has acquired this tolerance for As, produces H_2S or some other compd.

according to its race, and these compds. neutralize the toxic action of the As. The acquired tolerance of microorganisms for toxic substances is frequently due to the secretion, in the protoplasm of the microorganism, of a substance which neutralizes the toxic substance: Ca in the case of acquired tolerance for alk. fluorides, H_2S in the case of acquired tolerance for As, oxidases in the case of acquired tolerance for HCHO which is then oxidized to HCOOH. The mechanism of this acquired tolerance depends on selection and not on true immunization.

JOSEPH S. HEPBURN

Coagulation of phosphated plasma by staphylococci. ANDRÉ GRATIA. *Réunion soc. belge biol.* 1920, 139-40; *Physiol. Abstracts* 5, 405-6 (1920).—Staphylococci produce coagulation of oxalated plasma from which the serozyme has been removed by treatment with a small amt. of $Ca_3(PO_4)_2$. When blood is treated with a large amt. of $Ca_3(PO_4)_2$ as it emerges from the artery, a non-coagulating plasma is obtained, which is coagulated by the staphylococci less rapidly and less completely than normal oxalated plasma. These facts led to a study of phosphate-treated plasma. When normal plasma was mixed with phosphate-treated plasma in the ratio 1:100 or 1:200 or 1:500, coagulation was produced. Therefore the failure of phosphate-treated plasma to coagulate was due to a deficiency of serozyme and not to a simple disturbance of the normal relation between coagulating and anticoagulating substances.

J. S. H.

Observations on the communication of Gratia. P. NOLF. *Réunion soc. belge biol.* 1920, 140-1; *Physiol. Abstracts* 5, 405-6 (1920); see preceding abstr.—Oxalated plasma was mixed in different proportions with the same oxalated plasma which had also been treated previously with a considerable amt. of $Ca_3(PO_4)_2$. Dilns. were also made in the ratio 1:10, an isotonic saline soln. which contained 0.2% $CaCl_2$ being used. None of the liquids coagulated spontaneously. Alc. exts. or aq. exts. of organs were added to these mixts., and were found to exert but a slight coagulating action, and to act only on the more concd. mixts. The results were different when the plasma was treated with only a small amt. of $Ca_3(PO_4)_2$. Plasma treated with a large amt. of that compd. was not coagulated by staphylococci.

JOSEPH S. HEPBURN

Observations on the communications of Gratia and Nolf. E. ZUNZ. *Réunion soc. belge biol.* 1920, 141-2; *Physiol. Abstracts* 5, 405-6 (1920); cf. 2 preceding abstracts.—Z. attributes the different results obtained by G. and by N. to different conditions during the expts. Stress is placed upon the difficulties arising from the use of $Ca_3(PO_4)_2$, the mol. of which has a very different solv. according to the conditions of the expt.

JOSEPH S. HEPBURN

Influence of the sugars on the production of indole. A. NACHTERGAELE. *Réunion soc. belge biol.* 1920, 157-8; *Physiol. Abstracts* 5, 436 (1921).—The different sugars inhibit, to a different extent, the production of indole by various microorganisms.

JOSEPH S. HEPBURN

Fungi and bacteria responsible for the deterioration of South African sugars (VAN DER BIJL) 28.

D—BOTANY

CARL L. ALSBERG

The physiological significance of tannic acid. FRIEDRICH CZAPEK. *Collegium* 1921, 227-32.—There is a relation between tannin and the production of color, especially anthracyanide colors, but the exact relation is not known. Sugars and probably albumins also bear some relation to tannin. Tannins and glucosides may act as sugar carriers, and possibly as carriers of O_2 since they can combine with alkalies and alc. Kraus found that there was a decrease in tannin when carbohydrate assimilation was stopped and Büsgen was able to increase the tannin in leaves kept in the dark, by injecting sugar into the stems. Sunlight causes an increase in quantity of tannin. Büsgen

found that the leaves in the sun contained 3-4 times as much tannin as those in the shade. Cavoza found a minimum amt. of tannin in leaves at sunup and a max. at 6 p. m. and in evergreen leaves a minimum in Mar. and a max. in Sept. Kraus found that colored leaves contained more tannin than green ones, that falling leaves contained as much tannin as leaves at the height of vegetation, and that the heart wood of trees contained much more tannin than the sap wood. The accumulation of tannin in the periphery of tissues serves as a protection against feeding animals and decompg. agencies. Plants can, however, live without tannin for Pfeffer was able to ppt. the tannin with methylene blue without injuring the cells and no tannin was found in *Phaseolus* when grown in a chloride-free medium by Aschoff. Many consider the tannin as a waste product having no vital part in life processes. A list of references is given. I. D. C.

Assimilation of nitrogen, phosphorus, and potassium by corn when nutrient salts are confined to different roots. P. L. GILES AND J. O. CARRERO. Porto Rico Agr. Expt. Sta. *J. Agr. Research* 21, 545-73 (1921).—Expts. are reported showing how the assimilations of N, P and K were affected when half the roots of the plant were in a complete nutrient soln., and half in a soln. lacking 1 or more essential elements, when the roots were divided between 2 solns. each of which lacked 1 or 2 elements and when the roots were divided among 3 solns. each of which lacked 1 or 2 elements. The seedlings were grown in the nutrient solns. in Erlenmeyer flasks. The solns. were renewed 6 times during the 20 day tests. The compns. of the nutrient solns. were tabulated. Analyses of the plants for N, P and K were made. The growth of the plants in g. was tabulated and also the % absorption of the 3 elements. Depressions in growth and in assimilation of nutrients were roughly proportional to the incompleteness of the solns. afforded the roots. Increased subdivision of the roots did not diminish assimilation unless the division entailed increased localization of the supply of the various nutrients. The more growth and assimilation were depressed by division of the roots among incomplete solns. the higher was the ratio of root growth to top growth. When different portions of the roots were supplied with different nutrient solns., the roots in the more complete solns. generally made the greater growth and had a more bushy habit of growth. In the solns. lacking 2 elements the main roots were longer than in the more complete solns., the lateral roots were fewer, and the laterals were farther apart on the main root. When the roots were divided between solns. lacking the same number of nutrients, root growth was greatest in the solns. contg. N. The relative as well as the abs. root growth made in any soln. however depended on the character of the soln. in which the rest of the roots were growing. When the roots were divided among 3 incomplete solns. each of which lacked 1 or 2 of the elements N, P and K, the amt. of N assimilated approached the normal assimilation of N (the assimilation of plants with all of their roots in a complete soln.) considerably nearer than the amt. of K assimilated approached the normal assimilation of K; also K was assimilated to a very slightly nearer normal extent than P.

F. C. COOK

Catalase, hydrogen-ion concentration, and growth in the potato wart disease. FREEMAN WEISS AND R. B. HARVEY. Bur. of Plant Industry. *J. Agr. Research* 21, 589-92 (1921).—The catalase detns. were made in a Van Slyke amino-N app., fresh H_2O_2 previously neutralized with $CaCO_3$ being used. The H-ion detns. were made by the potentiometric method, a bubbling electrode being used. Overgrowth was produced by the potato wart disease of the Irish potato caused by *Chrysophyctis endobiotica* Schilb. The H-ion concn. of potato wart tissue is constantly greater than that of healthy tubers from the same plant, the values being represented by p_H 6.00 and p_H 6.49, resp. The catalase values are greater in the wart potato tissue, viz. 17.9 cc. of O_2 against 7.8 cc. for healthy tissue. Catalase activity is strongly correlated with growth in spite of the higher acidity of the proliferation and in this respect differs from other types of plant

overgrowth previously studied. Differences in acidity of the varieties are not associated with immunity to the disease.

F. C. COOK

Studies in the physiology of parasitism with special reference to the secretion of pectinase by *Rhizopus tritici*. L. L. HARTER AND J. L. WEIMER. Bur. Plant Ind., U. S. Dept. of Agr. *J. Agr. Research* 21, 609-25 (1921).—An enzyme of this fungus acts upon the pectic compds. of the cell walls causing loss of coherence. The macerating action of the enzyme contained in the hyphae and that exuded from the mycelium into the culture soln. were both studied. The medium employed was a decoction made from sweet potatoes. Sweet potato disks were used for the maceration tests. At the end of the incubation period, the fungus growth was removed, washed in running water for 15 mins. and then treated with acetone and ether. Generally, 0.25 g. of the mycelium powder ground in fine quartz sand plus 25 cc. of distd. H_2O and 5 sweet potato disks 1 mm. thick and 15 mm. in diam. were incubated in 120-cc. Erlenmeyer flasks for 3 days at 32.5°. Loss of coherence of the tissue was regarded as complete when the disks offered no resistance to pull. Data are presented showing that *Rhizopus tritici* produces both a powerful intracellular and extracellular pectinase which dissolves the middle lamellae of raw sweet potato disks in from 2 to 5 or more hrs. depending on the length of time the organisms grew in the cultures. The most vigorous enzyme was contained in cultures 1-3 days old. The optimum temp. for activation is between 45° and 55°. At 60° deactivation is practically instantaneous; below 45° the activity of the enzyme decreases simultaneously with the decrease of temp. The concn. of the enzyme influences, but the vol. of the enzyme soln. does not influence the rate of maceration. Exposing the hyphae for 3 hrs. to direct sunlight does not affect its macerating power. Centrifuging to remove sand and débris causes slight deactivation. Filtering the soln. in which the powdered hyphae and sand are suspended through filter paper weakens the enzyme; filtering the soln. after the removal of the fungous felt does not weaken it. Extn. of the powdered hyphae for 18 hrs. in H_2O does not increase the rate of maceration when compared with hyphae not extd. Toluene, used as a preservative, has no action on the enzyme. The amt. of sand used for grinding the hyphae, the treatment of the hyphae with acetone for 12 mins. and with ether for 3 mins., also washing the hyphae in running water for 15 mins. have no influence on the macerating action of the hyphae. This enzyme belongs to a large group of organisms incapable in themselves of penetrating the unbroken cells of the epidermis mechanically or of dissolving them with its enzyme. However, it works with great rapidity once it has reached the tissue below the epidermis and is characterized by its ability to "act in advance" of its growth.

F. C. COOK

The conditions for the biological activity of Röntgen rays. I. EUGEN PETRY. *Biochem. Z.* 119, 23-44 (1921).—An attempt to det. the factors in the resistance of resting seeds to harm by X-rays, based on the idea that a detn. of the exact process of germination which is affected by the radiation should serve to throw light on the problem. It was found that radiation of germinated seedlings cooled to 4° effectually retarded further root development. Expts. with seedlings poisoned by KCN or $AgNO_3$ gave similar results. These findings indicate that the toxic effect of Röntgen radiation is independent of the processes usually associated with both the metabolism and the respiration of such organisms. Finally it is shown that the presence of mol. O_2 is not an essential condition for the harmful effect of the X-rays, although the amt. present may possibly be of significance. P. therefore is of the opinion that the effect is a purely photo-chem. phenomenon in the nature of an alteration of some important cell constituent.

F. S. HAMMETT

The presence and action of saccharophosphatase in the plant organism. ANTONIN NĚMEC AND FRANTIŠEK DUCHON. *Biochem. Z.* 119, 73-80 (1921).—A study of the action of various plants and seedlings on Na saccharophosphate ($C_{12}H_{21}O_{10}PO_4Na$)

and Ca saccharophosphate ($C_{12}H_{21}O_{10}PO_3Ca$) (formulas as given) in an endeavor to demonstrate the presence of an enzyme "saccharophosphatase" in the same, by measuring the amt. of P_2O_5 , saccharose and invert sugar produced. The effect of acid and alkali on the enzyme action is also reported. The results indicate that in several resting seeds of the higher cultivated plants as well as in the leaves of *Solanum tuberosum* there is present an enzyme which splits off inorg. phosphates from the "artificial" compds. Na and Ca saccharophosphates. Watery exts. of the seeds so act on the Ca compd. as to yield $Ca_3(PO_4)_2$. The fat or oil-bearing seeds appear to have the most marked enzyme activity. A small amt. of alkali completely stops the process while a slight acidity markedly increases the decompn. The optimum acidity for saccharophosphatase (that of maize 0.03 N) is significantly higher than that for the autolytic phosphatases of the seeds, e. g., 0.004 N.

F. S. HAMMETT

The water-soluble coloring matters of the Schizophyces. KARL BORESCH. *Biochem. Z.* **119**, 167-214(1921).—An extensive study of the pigments of the Schizophyces based on the detn. of their characteristic optical properties, particularly the accurate measurement of their absorption spectra. Some 22 species were studied. Charts are given of the absorption spectra of their aq. exts. A part of them were found to contain only a blue pigment which is designated as the blue-green modification of phycocyan. Other modifications of this pigment were not found in these species. Many of the organisms contained in addition to this compd. a red pigment of orange-yellow fluorescence and only an absorption max. in the green between the Fraunhofer lines *D* and *E*. On account of this, and because they differed from the florid red, they were designated as the "Schizophyceenphycocerythrin" group. This pigment could be sep'd. from phycocyan by capillary analysis. In a few of the species the phycocerythrin modification occurred alone.

F. S. HAMMETT

Division of vacuoles and nuclei-dividing protoplasts. E. KÜSTER. *Ber. botan. Ges.* **36**, 283-92(1918); *Physiol. Abstracts* **5**, 505(1921).—A study of the changes produced in the epidermal cells of the scales of the onion bulb by immersion in normal solns. of sucrose, $CaCl_2$, and $Ca(NO_3)_2$.

JOSEPH S. HEPBURN

The organic food of the higher green plants. F. CZAPEK. *Naturwissenschaften* **8**, 226-31(1920); *Physiol. Abstracts* **5**, 504(1921).—A general discussion. J. S. H.

Plant growth and carbon dioxide. H. FISCHER. *Naturwissenschaften* **8**, 413-7(1920); *Physiol. Abstracts* **5**, 504(1921).—A general discussion. JOSEPH S. HEPBURN

The starch assimilation product. H. FISCHER. *Naturw. Wochschr.* **19**, 24-6(1920); *Physiol. Abstracts* **5**, 505(1921).—A general discussion. JOSEPH S. HEPBURN

Recent advances in science—Plant physiology. R. C. KNIGHT. *Science Progress* **16**, 26-31(1921).—Review of recent work on the root system, and the factors (largely chem.) which influence its part in the nutrition of the plant. JOSEPH S. HEPBURN

Application to plants of a biochemical procedure for the study of glucose. M. BRIDEL AND R. ARNOLD. *Compt. rend.* **172**, 1434-6(1921); cf. Bourquelot and Bridel, *C. A.* **14**, 2005, 2937.—The most satisfactory procedure is as follows: The plant to be tested is treated with boiling alc. to destroy enzymes and fix its compn. The alc. ext. thus obtained is dissolved in a measured vol. of water and the aq. soln. pptd. with basic lead acetate, the ppt. is centrifuged and the liquid after removing Pb by H_2S is evapd. to dryness under reduced pressure and at a temp. not above 50° to prevent the hydrolyzing action of $AcOH$ on the substances in the ext. The ext. is next exhausted with hydrated ethyl acetate which removes substances that interfere with the action of emulsin or otherwise vitiate the results. The exhausted ext. is treated 3 times with boiling 95% alc. The alc. liquids are united and distd. to dryness under reduced pressure in the presence of $CaCO_3$. The residue when cooled is taken up with 50% MeOH in aqts. varying with the proportion of reducing substances present. After filtration the liquid

Studies in the vitamine content. II. The yeast test as a measure of vitamine B. WALTER H. EDDY, HATTIE L. HEFT, HELEN C. STEVENSON AND RUTH JOHNSON. Columbia Univ. and N. Y. Hosp. *J. Biol. Chem.* **47**, 249-75(1921); cf. *C. A.* **14**, 3097.—The yeast test as a quant. measurement of vitamine B content is distinctly unreliable as many other factors are involved in addition to vitamine B. It may be possible to devise a basal medium providing an optimum of these factors except vitamine B but until this has been done the test must be considered of little value for estg. the true vitamine content. When the test is applied to substances the vitamine content of which has been detd. by rat-feeding expts., the results show only approx. agreement except when the exts. are dil. The optimum growth varies not only with the concn. but with the nature of the ext. tested and the growth stimulus is not a matter simply of the concns. of known constituents as claimed by Fulmer, Nelson, and Sherwood (*C. A.* **15**, 694). The curves indicate that the reaction is not a monomol. one; from the control point to the optimum it approximates the shape of the log curve but to the right of the optimum point there is a distinct decline indicating inhibitory factors in the higher concns. Some of the factors concerned in the stimulation are not destroyed by treatment with alkali but the data obtained do not warrant the conclusion that vitamine B is not one of the functioning stimulants.

A. P. LOTHROP

Studies on the digestibility of proteins in vitro. II. The relative digestibility of various preparations of the proteins from the Chinese and Georgia velvet beans. HENRY C. WATERMAN AND D. BREESE JONES. U. S. Dept. Agr., Bur. Chem. *J. Biol. Chem.* **47**, 285-95(1921); cf. *C. A.* **15**, 2475.—A comparative study was made of the digestibility *in vitro* by pepsin and trypsin of coagulated proteins and of raw and cooked dialyzed proteins from the Chinese and Georgia velvet bean. The extent of proteolysis was ascertained by detg. the amt. of amino N in the filtered reaction mixts. Cooking renders the dialyzed protein from either seed as digestible as the coagulated proteins. Partial indigestibility is undoubtedly the limiting factor in the failure of the raw dialyzed protein to promote growth and the normal growth which is obtained with the proteins prep'd. by coagulation is due to the increase in digestibility brought about by the boiling incident to the prepn. of the coagulated material. The ill effects following the use of the raw bean meal are the combined effects of the indigestibility of the proteins and the presence of the toxic substance, dihydroxyphenylalanine; cooked meal probably still contains the toxic substance. The results from the expts. *in vitro* run parallel with those of growth and utilization tests made with animals and an indigestibility sufficient to interfere seriously with the capacity of a protein to furnish the amino-acid requirement for normal growth may be readily demonstrated by the *in vitro* method.

A. P. LOTHROP

The metabolism of nitrobenzaldehydes and nitrophenylacetaldehyde. CARL P. SHERWIN AND WALTER A. HYNES. Fordham Univ. *J. Biol. Chem.* **47**, 297-301 (1921); cf. *C. A.* **14**, 3704.—"The fate of *o*-, *m*-, and *p*-nitrobenzaldehydes in the human body was much the same as that previously shown for the dog. In each case oxidation took place with the formation of the corresponding acid. In the case of the *o* compd. about 90% was excreted as the *o*-nitrobenzoic acid, while the *m* and *p* compds. were excreted to a large extent as the *m*- and *p*-nitrobenzoic acids, but also to a small extent combined with glycocoll and excreted as *m*- and *p*-nitrohippuric acid. In no case was there a reduction of the NO₂ group. *p*-Nitrophenylacetaldehyde was fed to rabbits, dogs, and a man. In each case there was only an oxidation to the corresponding acid, with no reduction of the NO₂ group or combination with either glycocoll or glutamine."

A. P. LOTHROP

Fat-soluble vitamine. VIII. The fat-soluble vitamine content of peas in relation to their pigmentation. H. STEENBOCK, MARIANA T. SELL AND P. W. BOUTWELL.

Univ. Wis. *J. Biol. Chem.* **47**, 303-8(1921); cf. *C. A.* **14**, 560; **15**, 2657.—"In ripe peas, out of six samples investigated, those of a green color, also carrying considerable yellow pigment, were far richer in their fat-sol. vitamine content than yellow peas which contained much less yellow pigment. That yellow peas are not to be classed with seeds of very low fat-sol. vitamine concn., such as wheat, oats, and barley, is shown by the very appreciable growth which occurred during 4 months subsistence on a ration containing 50% of peas (increase in wt. from 60 to 285 g.)." The relative yellow pigment contents of the 6 varieties studied were as follows: com. split 39, marrowfat 44, Canadian field 55, small green 76, Alaska 100, Scotch beauty 95. A. P. LOTHROP

The effect of hydrochloric acid ingestion upon the composition of the urine in man. RAYMOND L. STEHLE AND ARTHUR C. McCARTY. Univ. Pa. *J. Biol. Chem.* **47**, 315-9(1921); cf. *C. A.* **11**, 2925.—The diet used was ample as far as calorific value was concerned but was low in protein and NaCl and consisted of rice, French fried potatoes, bananas, wheat bread, jam, butter, apple pie and figs, all unsalted. 3.65 g. of HCl in the form of a 0.1 *N* soln. was ingested during the last 3 days of a 7-day period. The ingestion of the HCl caused an increased excretion of K, Na, NH₃, H₂PO₄, and H ions. If the bases of the body are drawn upon in any condition of acidosis in the same way as by the HCl, there would be required for every 3.65 g. of HCl (equiv. to 10.4 g. of β -hydroxybutyric acid), in order to balance the increased NH₃ formation and to meet the loss of K, Na, and H₂PO₄, 3.7 g. of KHCO₃, 0.98 g. of K₂HPO₄, and 3.88 g. of NaHCO₃. A. P. LOTHROP

Antiketogenesis. I. An *in vitro* analogy. PHILIP A. SHAFFER. Wash. Univ. Med. School. *J. Biol. Chem.* **47**, 433-48(1921).—"The oxidation of glucose in alk. soln. by H₂O₂ accomplishes the disappearance of acetoacetic acid if the latter be present in the soln. Acetoacetic acid in the absence of glucose or other 'ketolytic' substance is oxidized very slowly by H₂O₂, but its disappearance is rapid even at room temp. if glucose is simultaneously oxidized. Fructose and glycerol exert the same effect as glucose, while lactic acid is without such action. The rate of the 'ketolytic action' is increased with alkalinity, temp., and the amt. of glucose or other ketolytic substance. The rate of the reaction appears to be detd. primarily by the rate of the 'dissociation' or the conversion of glucose by alkali into a derivative which is then oxidized. The inference seems justified that it is some intermediate oxidation product of glucose which combines with acetoacetic acid, the compd. being then further oxidized. The phenomenon is believed to be an *in vitro* analogy to the action of glucose and of similar substances in abolishing or preventing the formation (accumulation) of acetoacetic acid and the related acetone and β -hydroxybutyric acid in man." II. The ketogenic antiketogenic balance in man. *Ibid.* 449-73. "Starting with the hypothesis that the property possessed by carbohydrate and other substances of preventing the appearance of acetone bodies (the phenomenon of 'antiketogenesis') is due to a chem. reaction in the body between definite and const. amts. of 'ketogenic' and antiketogenic' compds., analogous to the 'ketolytic' reaction between acetoacetic acid and glucose described in the preceding abst., a trial method has been developed for the calcn. of the mol. amts. of ketogenic and of antiketogenic substances derivable from protein, fat, and carbohydrate. The application of this calcn. to various subjects, who were excreting small amts. of acetone bodies, indicates that the general hypothesis is correct and that the minimum mol. ratio of ketogenic to antiketogenic substances for the avoidance of ketonuria in different human subjects is 1. This conclusion is confirmed by the calcn. of data from a case of 'total' diabetes with extreme acidosis, the total hydroxybutyric acid excretion being approx. accounted for and in fair agreement with the calcd. expectation. Such diets as supply from carbohydrate at least 10%, from protein about 10%, and from fat not more than 80% of the energy required by the subject, will produce little or no ketonuria.

There appears to be no reason for believing that any factors other than those concerned with this ratio influence acetone body formation. No difference is to be expected in the behavior of different human subjects, whether normal or diabetic, as regards acetone body formation, except as accounted for by the excess of ketogenic over antiketogenic mols. in the mixt. being catabolized." Some of the results obtained indicate that the relative values assigned to the antiketogenic factors are not entirely correct and will need some modification after further investigation; the relative values assigned to the ketogenic factors are believed to be approx. correct. The calcd. values are in such close agreement with those actually found that the errors in the method of calcn. cannot be of any great magnitude.

A. P. LOTHROP

Cattle feeding investigation. W. L. BLIZZARD. Okla. Agr. Expt. Sta. *Bull.* 134, 7 pp. (1920).—Both sunflower and dorso silage when combined with corn, cottonseed meal and alfalfa proved good feed for beef production. Cattle fed sunflower silage shrunk 5.3 lbs. per head and dorso silage 21.5 lbs. in shipment. J. J. SKINNER

Cholesterol metabolism. HERMANN STRAUSS. *Med. Klin.* 17, 20-1 (1921).—A consideration of the knowledge available concerning cholesterol metabolism suggests that cholesterol may appear from some source other than the ingested food but such origin has never been proved. Under normal conditions cholesterol is excreted through the intestine, only under pathol. conditions through the kidney. The only change in cholesterol taking place within the body, apart from the formation of esters with the higher fatty acids, is the oxidation to cholic acid. Cholesterol plays an important part in the intermediary metabolism of lipoid, phosphatid, and fats, as well as in hemolytic phenomena.

G. H. S.

ABNORMAL

Creatine-creatinine metabolism in myxedema and in healthy individuals under the influence of thyroïdin. H. BEUMER AND C. ISEKE. *Berlin klin. Wochschr.* 57, 178-80 (1920); *Physiol. Abstracts* 5, 562 (1921).—Thyroïdin increased the output of creatine by increasing the protein katabolism; this effect was more marked in myxedema. The excretion of creatinine remained unchanged.

JOSEPH S. HEPBURN

Nature of beriberi and related diseases. M. GOTO AND T. TAKAHATA. *Fukuoka Ikwadaigaku Zasshi* 11, No. 4, 17 (1918); *Jap. Med. Literature* 5, 20 (1920).—As a result of feeding expts. made on mice, rabbits, and hens, the conclusion is drawn that beriberi is caused by cholic acid and its derivs.

JOSEPH S. HEPBURN

Experimental rickets in rats. II. The failure of rats to develop rickets on a diet deficient in vitamine A. A. F. HESS, G. F. McCANN, AND A. M. PAPPENHEIMER. College of Phys. and Surgeons, Columbia Univ. *J. Biol. Chem.* 47, 395-409 (1921); cf. *C. A.* 14, 3709. —Young rats were fed a diet markedly deficient in the fat-sol. vitamine and constituted as follows: purified casein 21, rice starch 57, salt mixt. 5 and Crisco 17%; yeast 60 mg. The yeast (and in one group of animals orange juice) was not incorporated in the food but given separately. A control set of rats received the same diet except that 6% of butter fat replaced an equiv. amt. of Crisco. "Young rats receiving the diet complete except for lack of the fat-sol. vitamine invariably failed to grow and generally developed keratitis. The keratitis developed less frequently when the ration included orange juice; probably a deficiency of the antiscorbutic factor intensifies the alteration of the cells brought about by other nutritive deficiencies. If this diet is continued for a period of months the animals die, either of inanition or, more often, of some intercurrent infection. The skeletons of such rats show no gross changes whatsoever. Microscopic examn. of the bones of 22 rats on a ration of this character presented definite signs of a lack of active osteogenesis, but in no instance lesions resembling rickets. In view of these results and their conformity with our previous experience in regard to infantile rickets, we are of the opinion that this vitamine cannot be regarded

as the antirachitic vitamin, and that, if the diet is otherwise adequate, its deficiency does not bring about rickets."

A. P. LOTHROP

Metabolism of dogs during the production of morphine tolerance and in morphine hunger. KONRAD SCHÜBEL. *Arch. exptl. Path. Pharm.* **88**, 1-29(1920).—During the establishment of morphine tolerance or in morphine hunger in dogs the pathologic manifestations are chiefly those of gastro-intestinal origin, associated with secretory disturbances and the resultant functional impairment of the digestive organs. The gastric secretion is deficient in both HCl and in peptolytic ferment. The disturbances in body wt. are ascribed to the lipuria which is present and to deficient nourishment. There is an increased elimination of P_2O_5 , purine bases and fat. Accompanying the digestive disturbance there occurs marked changes in the central nervous system, such as an increased decompn. of nuclein combinations. This nervous system manifestation is much more pronounced if the administration of morphine to an habituated animal is suddenly stopped. In morphine hunger cessation of administration of the drug results in definite "abstinence manifestations" due to the occurrence of an excessive hypersecretion of HCl which acts as an irritant upon the stomach and intestinal mucosa. When the administration of morphine is stopped, the elimination of P_2O_5 and of purine bases diminishes.

G. H. S.

F—PHYSIOLOGY

ANDREW HUNTER

The relations between the potassium ion and excitation of the pneumo-gastric nerve. J. BOUCKAERT. *Arch. intern. physiol.* **16**, 453-60(1921).—Expts. are reported which tend to show that the K ions in the circulation are important factors in the activity of the vagus nerve.

F. S. HAMMETT

Colloid studies on the structure of the red blood corpuscles and hemolysis. III. **Ultramicroscopic study of lipoids.** KENZO HATTORI. *Biochem. Z.* **119**, 45-64(1921).—A description with plates of the forms taken by lecithin and cholesterol when treated with H_2O , NaCl soln., $HgCl_2$ soln. of various concns., acetone and saponin as viewed with the ultramicroscope. Various lecithin and cholesterol mixts. were also similarly studied. It was found that optically homogeneous mixts. of the 2 compds. were separable by various agents. The mechanism of this sepn. varies, e. g., H_2O causes lecithin to swell so that the disperse cholesterol phase no longer remains in the same physico-chem. condition. Since physiol. NaCl soln. prevents this, H. considers that this salt acts as a stabilizer for the bio-colloids of the organism. There is no complete agreement between the phenomena of hemolysis and sepn. of the lipoids although it is true that substances which bring about the latter also produce the former. Saponin is an exception in some concns. In isosmotic salt solns. the process of sepn. depends not only on the concn. but also on the type of salt used. It is, however, considered probable that the process of hemolysis is attributable in part at least to a dissolution of the homogeneous mixt. of cell lipoids which make up the restraining structure of the red corpuscles.

F. S. HAMMETT

Viscometry and stalagmometry of urine. ERNST JOËL. *Biochem. Z.* **119**, 93-107 (1921).—The J. Traube viscostagmomenter was used in these studies. The relative viscosity q represents the quotient of the time expressed in seconds required by the liquid under investigation to pass through the app. as compared with an equal vol. of distd. H_2O at the same temp. The relative surface tension γ represents the drop number in percent relation to distd. H_2O . It was found that the relative viscosity of normal urine is between 1.0 and 1.05. It does not run strictly parallel with the urine concn. or sugar content. Formed elements tend to increase the viscosity to a marked degree. The increase in viscosity due to the presence of pathological protein is of significance. In all urines having a high colloid content the colloids affect the

viscosity much more than they do the sp. gr. No characteristic viscosity values could be established for the various diseases studied. An artificial, colloid-free urine has the same surface tension as pure H_2O . The addition of glucose or acetone tends to lower this slightly while bile and serum produce a greater effect. Data for the surface tension of bile are given as well as the varied bathotonic effect of bile on $NaCl$ solns., urine and distd. H_2O . The surface tension of icteric urine and serum is significantly lowered. Etiologically conditioned differences could not be observed. Surface tension values of hemoglobin solns. are given and also values in hematuria and hemoglobinuria. F. S. HAMMETT

The internal secretion of the spleen. NATHAN B. EDDY. *Endocrinology* 5, 461-75 (1921).—A review, the conclusion of which is that the hypothesis that the spleen produces an internal secretion is supported by (1) the changes in erythrocytes after splenectomy, (2) the modification of the blood picture in hyperplasia of the spleen, ameliorated in some cases at least by splenectomy, and (3) the sp. effects on the red blood corpuscles of injection of splenic extracts. Admittedly nothing is known of the chem. nature of the supposed splenic hormone. A tentative hypothesis is given of its possible mode of action, based on the idea that the chief function of the spleen is the removal from the circulation of the disintegrated erythrocytes. The splenic cells are supposed to elaborate this material and produce thereby an internal secretion which is a component of the erythrocyte either stroma or pigment portion. This internal secretion reduces the resistance of all the red blood corpuscles, the effect amounting to actual destruction of the older cells. Another possible action of this secretion is a stimulation of the erythrogenic function of the bone marrow. F. S. HAMMETT

Functional cell structure of the liver. I. The liver cells of *Salamandra maculata* during a state of good nutrition and of hunger. The action of food and of accelerated secretion of bile in hungry animals. W. BERG. *Arch. mikr. Anat.* 94, 518-67 (1920); *Physiol. Abstracts* 6, 55 (1921).—In the livers of well fed animals, the cytoplasm contained numerous fine droplets or granules which responded to the microchem. tests for proteins, and were quite distinct from the delicate plastosomes. These granules apparently consisted of partially hydrolyzed protein; their formation and disappearance apparently were in no way connected with the plastosomes. The administration of cholagogues greatly reduced the number of plastosomes. JOSEPH S. HEPBURN

Orthodontic markings of endocrine function and their importance in diagnosis. THOMAS E. PROSSER. *Dental Cosmos* 63, 808-9 (1921).—An account of the influence exerted on the teeth by the internal secretion of the pituitary, thyroid, parathyroids, and gonads. JOSEPH S. HEPBURN

Origin of the blood platelets. A. PERRONCITO. *Haematologica* 1, 265-72 (1920); *Physiol. Abstracts* 5, 392 (1920).—When pyrodine (hydracetin, C_6H_5NO) is injected intravenously into animals whose blood has been defibrinated as completely as possible, an increase occurs in the number of platelets. The increase, however, is not comparable with that produced by injection of pyrodine into normal animals, and apparently is proportional to the amt. of non-defibrinated blood remaining in the circulation. While pyrodine may possibly exert a positive chemotropic action on the platelets accumulated in the spleen, yet the results obtained support the theory that the platelets originate from the red and white cells of the circulating blood. JOSEPH S. HEPBURN

Role of lactic acids in the energetics of the muscle. OTTO MEYERHOF. *Naturwissenschaften* 8, 696-704 (1920).—A lecture. Sections are devoted to the chem. processes in muscular activity, the mechanism of the chem. changes undergone by glycogen and glucose in the muscle, production of heat during the phase of work and the phase of recovery, formation of lactic acid and mechanical performance, and the theory of contraction. A bibliography of 19 references is appended. Cf. *C. A.* 15, 2307. JOSEPH S. HEPBURN

Carbon dioxide production in woman with special reference to the influence of prolonged under-nutrition. H. OLIN AND C. TIGERSTEDT. *Oversigt Finska Vetenskaps-Soc. Forhandl.* 1918-19; *Helsingfors A. Math. Naturw.* 61, No. 18, 1-32(1920); *Physiol. Abstracts* 5, 309.—In expts. of 24 hours duration, the production of CO_2 per kg. of body wt. per hour had a mean value of 0.142 g. in men, 0.138 g. in normal women, and 0.122 g. in underfed women. The low value in underfed women was partly due to a decrease in the amt. of living tissue, and represented an actual reduction in the total metabolism.

JOSEPH S. HEPBURN

Presence of urea in the expired moisture. G. BATTEZ AND CH. DUBOIS. *Réunion soc. belge. biol.* 1920, 83-5; *Physiol. Abstracts* 5, 412(1921).—The hypobromite and the xanthydrol tests showed the absence of urea in the moisture condensed from the air expired by a dog.

JOSEPH S. HEPBURN

Histophysiological study of the excretion of certain salts by the kidney. JEAN FIRKET. *Réunion soc. belge biol.* 1920, 126-8; *Physiol. Abstracts* 5, 421-2(1920).—Either $\text{Na}_2\text{FeC}_6\text{N}_6$ or that salt plus ammoniacal Fe^{+++} citrate was injected intravenously into the living cat. The kidneys were removed several min. later and were treated with an acid-fixing agent which caused the formation of Prussian blue in the interior of these organs. The uriniferous tubules contained a granular ppt. of Prussian blue, which occurred chiefly as a fine border like a tuft of hairs at the edge of the epithelium of the convoluted tubules; this indicated absorption of liquid by the epithelium. J. S. H.

Histophysiological study of the excretion of certain salts by the kidney of the embryo. JEAN FIRKET. *Réunion soc. belge biol.* 1920, 148-9; *Physiol. Abstracts* 5, 421-2(1920).—The technic described in the preceding abstract was used; and the injection was made into the umbilical vein of a living cat embryo still contained in the maternal uterus. The kidney of the embryo was able to excrete cryst. salts at a very early stage of its development, a phenomenon requiring the differentiation, even though incomplete, of the glomerulus.

JOSEPH S. HEPBURN

Phosphorus and ash content of the human thyroid. E. ZUNZ. *Réunion soc. belge biol.* 1920, 146-7; *Physiol. Abstracts* 5, 424(1920).—Analyses were made of 32 thyroid glands of average wt. obtained from normal men killed in the war. The dry residue contained from 0.89% to 1.82%, av. 1.38% P, and from 2.60% to 5.11%, av. 3.86% ash. The ratio P : N ranged from 0.062 to 0.140, av. 0.094. The ratio I : N ranged from 0.004 to 0.029, av. 0.0154. The ratio I : P ranged from 0.025 to 0.422, av. 0.1813.

JOSEPH S. HEPBURN

Electric resistance of the cells and the tissues. M. PHILIPPSON. *Réunion soc. belge biol.* 1920, 1399-1402; *Physiol. Abstracts* 6, 18(1921).—Using an a. c. of high frequency, the sp. resistance of living tissue (cube of tissue, each edge of which measured 1 cm.) was detd. This resistance was very high when the frequency was 1000 per sec., but decreased more or less rapidly as the frequency increased and finally attained a minimum value, which represented the true resistance of the cellular substance and was a measure of the association of the salts and org. substances in the living cells. This sp. resistance was generally equal to that of a soln. of NaCl whose mol. concn. was half the mol. concn. of the ext. of the organ. The conclusion was drawn that half the salts of the ext. are combined with org. mols. in the cell.

JOSEPH S. HEPBURN

Anticoagulant action of plasma treated with phosphate. P. NOLF. *Réunion soc. belge biol.* 1920, 1573-5; *Physiol. Abstracts* 6, 36(1921); cf. *C. A.* 15, 2504.—Plasma from a fowl or a rabbit was kept in a vessel lined with paraffin and was treated twice with an emulsion of $\text{Ca}_3(\text{PO}_4)_2$. The plasma then exerted a marked anticoagulant action on both the blood and the plasma of the bird and of the rabbit. Thus when one of the factors concerned in coagulation was removed from the plasma, that liquid acquired anticoagulant power.

JOSEPH S. HEPBURN

Starch granules converted into glycogen after injection into the tissues of the rabbit. M. OKOZAKI. *Sei-I-Kwai Med. J.* 38, 1-5(1919); *Japan Med. Literature* 5, 20(1920).—Seven or more days after their intravenous injection, starch granules, which had deposited in the lung or the liver, gave a positive reaction for glycogen with ammonia carmine and I. The same change in the staining reaction of the granules occurred when the starch was injected into the corium. The rapidity and the extent of this change in the granules was not increased by preliminary intravenous injections of granules of starch of the same or different species. JOSEPH S. HEPBURN

Influence of marked venesection upon the retention products accumulated in the blood and muscular tissues of nephrectomized dogs; contribution to the knowledge of the rest nitrogen content of the musculature. E. BECHER. *Z. klin. Med.* 90, 7-28 (1920); *Physiol. Abstracts* 5, 500(1921); cf. *C. A.* 14, 1363.—The residual N content of both the blood and the muscles, and their content of indican, creatinine, and uric acid are increased when from 20% to 45% of the total amt. of blood is removed from nephrectomized dogs by bleeding. Only a small fraction of the total amt. of residual N present in the body is removed by the bleeding. JOSEPH S. HEPBURN

The cerebrospinal fluid. VII. The volume changes of the cerebrospinal fluid after adrenaline, pituitrin, pilocarpine and atropine. F. C. BECHT AND H. GUNNAR. Northwestern Univ. Med. School. *Am. J. Physiol.* 56, 231-40(1921); cf. *C. A.* 14, 2368.—By using an improved method for measuring and recording graphically the amt. of fluid in the skull, it was found that adrenaline, pituitrin and pilocarpine do not increase the formation of cerebrospinal fluid. Atropine following pilocarpine may cause an increased outflow of cerebrospinal fluid, probably due to increased blood pressures inside the skull as a result of the atropine administration. J. F. LYMAN

Comparative study of ethyl alcohol, caffeine and nicotine on the behavior of rats in a maze. D. I. MACHT, WM. BLOOM AND GIN CHING TING. Johns Hopkins Univ. *Am. J. Physiol.* 56, 264-72(1921); cf. *C. A.* 15, 1945.—The drugs were injected into white rats trained to enter a circular maze. In all dosages all 3 drugs were depressing rather than stimulating, nicotine having the greatest effect, caffeine next and EtOH being the least depressing in effect. J. F. LYMAN

The thyroid apparatus. II. The changes in the amount of intestine-contracting substances of the thyroid of the albino rat according to age. F. S. HAMMETT AND K. TOKUDA. Wistar Inst. *Am. J. Physiol.* 56, 380-5(1921).—The substances in the thyroid of the albino rat capable of causing contraction of intestinal segments vary with the age of the rats. There are 4 periods in the life cycle when sharp increases in the intestine-contracting substances were noted: (1) at birth, (2) at weaning, (3) at puberty and (4) at the time rapid growth is about completed. Each of these points of increased activity is followed by a period in which the exts. are less active, though the general trend is toward an increase until full maturity, when the activity falls to a fairly uniform level. III. The action of thyroxin on the isolated intestinal segment. F. S. H. *Ibid* 56, 386-9(1921).—Solns. of thyroxin in 0.066 M NaOH, in concns. from 5×10^{-3} to 6.4×10^{-3} mg. to 25 cc. do not cause any increased contraction of the isolated intestinal segment over that produced by equiv. amts. of NaOH used as a standard. At concns. of 3.2×10^{-7} to 6.4×10^{-7} , thyroxin appeared to exert a repressant effect on the contraction produced by NaOH. Thyroxin is evidently not the constituent of the thyroid which causes the contraction of the isolated intestinal segment described in the preceding paper. J. F. LYMAN

Carbon monoxide asphyxia. I. The behavior of the heart. H. W. HAGGARD. Yale Univ. *Am. J. Physiol.* 56, 390-403(1921).—Death under CO asphyxia is due to failure of respiration brought on by the excessive breathing induced by anoxemia which produces, in turn, an excessive loss of CO_2 and finally respiratory failure. O_2

deficiency caused by CO, even in advanced asphyxia, is not in itself sufficient to cause impairment of auriculo-ventricular conduction. There is no direct toxic action of CO upon the cardiac-conducting system. The impairment of cardiac conduction under CO is purely due to anoxemia. After CO poisoning, breathing an atm. contg. 7% CO₂ maintained respiration, prolonged life and increased the degree of CO satn. of the blood fatal to the animal. Illuminating gas results in an earlier development of respiratory failure than does pure CO in corresponding concn.

J. F. LYMAN

The mode of action of low temperatures and of cold baths in increasing the oxidative processes. W. E. BURGE AND J. M. LEICHSENRING. Univ. Ills. *Am. J. Physiol.* 56, 408-14(1921).—Exposure to cold produces an increase in blood catalase in warm-blooded animals and a decrease in cold-blooded animals. The increased oxidation in warm-blooded animals following exposure to cold is attributed to this increased catalase. Similarly the decreased oxidation in cold-blooded animals when exposed to cold is due to the resulting decreased blood catalase.

J. F. LYMAN

The replacement of potassium by uranium in perfusion of the heart. H. ZWAARDEMAKER. Utrecht. *J. Physiol.* 55, 33-7(1921).—The failure of Clark (*C. A.* 15, 2505) to confirm Z's. results is due to the former overlooking the facts (1) that the amt. of U required for effective substitution of K is not the same in summer and in winter frogs, and (2) that the amt. of Ca has great influence. "Radioactivity and not a disturbed ionic balance is the strict condition for automaticity." J. F. LYMAN

The coagulation of blood. I. The role of calcium. H. W. C. VINES. *J. Physiol.* 55, 86-99(1921).—A new method of detg. Ca in blood is used; it is based on the principle that the Ca content of blood and a standard Ca soln. must be equal when clotting is produced in the same time in two tubes, each contg. blood to which the minimal amt. of oxalate has been added to prevent clotting and to the one has been added a measured amt. of blood and to the other the same vol. of a Ca soln. of known strength. By this method freshly drawn blood shows a Ca content of 8.74 mg. and blood serum 10.74 mg. per 100 cc. This is interpreted to mean that 4 mg. or 37.4% of the Ca is combined in fresh blood in an un-ionized state. "The addition of oxalate, citrate or fluoride to normal blood in amt. chemically equiv. to the total Ca of the blood does not inhibit coagulation; this indicates that the presence of ionized Ca is not essential to the clotting process. The anticoagulants described all inhibit clotting primarily by combining with a Ca-contg. complex. Ca combined with an org. substance, at present not defined, is the essential factor in the commencement of blood coagulation; this complex probably corresponds to the thrombokinase of Morawitz."

J. F. LYMAN

The oxygen use of muscle and the effect of sympathetic nerves on it. H. NAKAMURA. Cambridge. *J. Physiol.* 55, 100-110(1921).—O₂ use was detd. from the compn. of the bloods entering and leaving the muscle and rate of blood flow. Rate of blood flow has no effect on O₂ use except when the rate of flow becomes very slow. If the sympathetic nerves have any tonic action on muscle, the tone does not lead to O₂ use. The ordinary extensor tone, kept up by the somatic nerves, likewise does not affect O₂ use.

J. F. LYMAN

The regulation of the supply of energy in muscular contraction. W. HARTREE AND A. V. HILL. Cambridge and Manchester. *J. Physiol.* 55, 133-53(1921).—A single maximal shock produces considerably more heat at a lower temp.; a tetanic stimulus of about 0.017 second duration produces practically the same heat at all temps.; a longer stimulus produces far more heat at a higher temp. In a prolonged maximal contraction there is a sudden outburst of heat for the first moment of the stimulus, succeeding elements of the stimulus producing less and less effect until a steady state is reached in which the heat is produced at a const. rate. In this final state the rate of heat production has a temp. coeff. of the exponential type, increasing 2.8 times for a

rise of 10°. Stirated muscle shows a very low efficiency in *maintaining a const. force*, but in a single twitch the efficiency in *producing potential energy* is very high, approx. 1. A physico-chem. mechanism is suggested to account for the manner in which the supply of energy is regulated in muscle. J. F. LYMAN

Interrelationship of function of the thyroid gland and of its active agent, thyroxin, in the tissues of the body. HENRY S. PLUMMER. *J. Am. Med. Assoc.* 77, 243-7 (1921).—An address. L. W. RIGGS

Effect of fluorescent rays upon the automatic activity of the surviving intestine of cold- and warm-blooded animals. RICHARD KOLM AND ERNST P. PICK. *Arch. expfl. Path. Pharm.* 86, 1-14 (1920).—When eosin is added to a surviving frog stomach prep., no change in tonus or in the pendular movements is noted, provided the tissue is kept in the dark. If, however, after the addition of the eosin the prep. is exposed to an intense illumination there is an immediate increase in tonus. As soon as the illumination ceases the tonus returns to normal. The change in tonus induced by eosin and light is maximal; the addition of pilocarpine gives no further increase. The increased tonus can be abolished by adrenaline or atropine. Nicotine is without effect. The changes brought about by the combined action of light and eosin are ascribed to a stimulation of the vagus nerve endings. When the small intestine of a warm-blooded animal (cat, rabbit, guinea pig) is exposed to the illumination after the addition of eosin the pendular movements gradually decrease in amplitude and within 30 min. or less cease altogether. This impairment of activity is permanent, in that activity is not restored if the illumination is stopped. Such preps. still react to pilocarpine, physostigmine, histamine, and pituitrin. It thus appears that in warm-blooded animals it is the ganglionic cells of Auerbach's plexus which are affected rather than the endings of the vagus. G. H. S.

Central nervous system regulation of salt displacement. W. H. VEIL. *Arch. expfl. Path. Pharm.* 87, 189-200 (1920).—Puncture of the fourth ventricle in the rabbit is followed quickly by a decrease in the NaCl concn. of the serum. The hypochloremia is abs. as well as relative and is accompanied by an hydremia. This is followed after 24 hrs. by a concn. of the blood. The fluctuations in salt and water content of the blood and urine are not primarily due to variations in kidney function but are rather of nervous origin. G. H. S.

Changes in the blood and in the body weight caused by sweating and by the administration of theocin with diets deficient and rich in salt. L. BOGENDÖRFER. *Arch. expfl. Path. Pharm.* 89, 252-62 (1921).—Exposure to a sweat bath causes a loss of 500-800 g. in body wt. In the course of 24 hrs. this loss is restored and the wt. may, for a time, attain a level somewhat higher than normal. This replacement of the loss is not accomplished by simply drinking water, but occurs only if sufficient NaCl or NaBr is present. After the sweating the number of erythrocytes increases and the high count persists throughout the chloride deficiency. Coincident with the increase in red cells there is a fall in serum chlorides. The amt. of serum protein varies. Similar effects follow the administration of theocin, particularly if the compd. is given with a diet lacking in NaCl. G. H. S.

Composition of fatty tissues under varying physiologic and pathologic conditions. OSKAR SCHIRMER. *Arch. expfl. Path. Pharm.* 89, 263-79 (1921).—Human fat from individuals of av. nutrition has an I value of 65-66.5 and m. p. 18-20°. The H₂O content varies within wide limits (from 5% to 71%). Not only does the type of nourishment affect the chem. compn. of the fat (in exptl. animals feeding with oil increases the I no.) but variations in compn. are associated with the state of nutrition; the fat of corpulent individuals shows an I no. of 70-71, while that of thin persons gives 60-62. Comparable changes in the m. p. are noted, the fat of high I no. having a lower m. p. Comparison

of I no. and m. p. is valid only when considered for an individual species; human fat of an I no. of 69 has a m. p. 16–20°; rabbit fat of the same I no. m. at 40°. In corpulent persons the H_2O content of the fat is relatively low as compared with that of cachectic persons. Similar relations are to be noted in other tissues although the differences are not so marked as in the fat. Certain diseases tend to lower the I no. of the fat; nephritis and diabetes in particular. In animals castration lowers the I no. Not only is the subcutaneous fat changed by the type of nourishment but similar changes may be detected in the mesenteric fat and in that of the kidney capsule. In fatty tissues of high H_2O content relatively more connective tissue is found than in tissues of low H_2O content. In general the cholesterol content is in inverse ratio to the I no. G. H. S.

Regulation of renal water elimination. CURT OEHME. *Arch. expl. Path. Pharm.* **89**, 301–31 (1921).—The elimination of water by the kidneys was detd. under various conditions, particularly when the animals had been subjected immediately before the test to a period of abundant water intake or to a period during which water was withheld. Diuresis occurred much more quickly when the preliminary period had been one of plentiful water intake. Under both conditions there was a hydremia (more marked in animals which had been on a restricted water supply). The administration of water produced changes in the hemoglobin and serum protein of –7.3 and –1.43%, resp., in animals on restricted intake and of –4.7 and –0.96% in animals which had been on abundant fluid ingestion. In the animals which had been deprived of water the administration of water changed the water balance +2.60; in those which had taken water freely the comparable figure was –5.8. The compn. of the blood (chlorides, sugar, urea, etc.) did not have a regulating influence upon the diuresis. Nervous regulation could not be demonstrated. The sera of animals of both types (abundant and restricted water intake) caused no peculiar differences in water elimination when injected intravenously into other animals; thus indicating that hormone action is not a detg. factor. It appears that the essential regulating factor must reside within the kidney itself, probably associated with the metabolic processes which have previously been taking place within the organ. G. H. S.

Zinc in the human and animal organism. E. ROST. *Med. Klin.* **17**, 123–4 (1921).—In the human body Zn is to be found in almost all organs and tissues, particularly in the liver and in the muscles. In the liver of infants there is 39–82 mg. per kg. of tissue, in adults, 52–145 mg. per kg. Zn is present in the secretions (milk, urine, feces), and in epidermal structures such as hair. Human milk contains 1.3–1.4 mg. per l.; goat milk 2.3 mg.; cow milk 3.9 mg. In the urine 0.6–1.6 mg., and in the feces 3–19 mg. are eliminated daily. Hair contains 9 mg. per kg. The Zn is derived largely from the meat eaten but some is taken in as vegetable matter. In the tissues the Zn exists in a more or less firm union with protein. G. H. S.

Concentrating activity of the gall bladder. PEYTON ROUS AND PHILIP D. MCMASTER. *Rockefeller Inst. Med. Research. J. Expl. Med.* **34**, 47–95 (1921).—The gall bladder and ducts exert opposite influences upon the bile. The ducts fail to concentrate and thicken it with mucus as the bladder does but dil. it slightly with a thin secretion of their own that is colorless and devoid of cholates even when the organism is heavily jaundiced. The fluid can be readily collected into a rubber bag connected with an isolated duct segment. It continues to be formed against a considerable pressure, and, in the dog, is slightly alk. to litmus, clear, almost watery, practically devoid of cholesterol, and of low sp. gr. to judge from the 1 specimen tested. This fluid is the so-called "white bile" of surgeons. When obstructed ducts connect with an approx. normal gall bladder the stasis fluid is entirely different, owing to the bladder activity. At first there accumulates a true bile much inspissated by loss of fluid through the bladder wall, darkened by a change in the pigment and progressively thickened with bladder

mucus. As time passes duct secretion mingles with the tarry accumulation and very gradually replaces it. The inspissation of the bile is at its greatest after only 1 or 2 days of stasis. The differing influences of the ducts and bladder upon the bile must obviously have much to do with the site of origin of calculi and their clin. consequences. This is discussed at length.

C. J. WEST

G—PATHOLOGY

H. GIDEON WELLS

The absorption of acacia from the pleural cavity of normal and tuberculous rabbits. H. J. CORPER AND O. B. RENSCHE. *Am. Rev. Tuberculosis* 5, 49-56 (1921).—By using a volumetric method for the approx. detn. of acacia in body fluids there was found to be no difference in the absorption of 7% acacia in saline soln., without or contg. a suspension of virulent human tubercle bacilli, after intrapleural injection in rabbits both normal or previously sensitized by the subcutaneous or intravenous injection of the same culture of virulent human tubercle bacilli: This tends to corroborate previous observations by the authors that there is no greater tendency towards the formation of a pleural effusion following the intrapleural injection of a suspension of tubercle bacilli in rabbits which have been previously sensitized with the same culture of bacilli. H. J. CORPER

The focal reaction. WILLIAM F. PETERSEN. Chicago. *Am. Rev. Tuberculosis* 5, 218-35 (1921).—A discussion not suitable for abstracting. H. J. CORPER

Regeneration of fibroelastic tissue of the skin. PAUL GRAWITZ. Greifswald. *Arch. path. Anat.* (Virchow's) 232, 35-57 (1921).—The connective tissue inflammatory reaction is the same in acute inflammations, foreign tissue transplants and tissue cultures in lymph. The transplanted tissue is surrounded by the fluids of the granulation tissue, a network of fibers staining red with safranine then forms and this is followed by cellular infiltration of the elastic and collagenic fibers with mitotic division of cells and healing is completed by the regeneration of fibrils of spindle cells. E. B. FINK

Effect of blood from immune animals upon transplantable tumors. ISADORE KROSS. Crocker Fund. *J. Cancer Res.* 6, 25-30 (1921).—If immune bodies exist in animals that are resistant to tumor growth, they are not present in the circulating blood. Transfusion of blood, if it has any influence, accelerates the development of a tumor, as regards both time and intensity of growth. The inadvisability of transfusing human cancer cases is therefore evident. The results of those investigators who report successful cures after injection of blood or serum must be explained by the assumption that they were either dealing with infectious granulomata or with tumors that disappeared spontaneously. E. B. FINK

Notes on the administration of hydrochloric acid. J. CAMPBELL McCLURE AND HENRY A. ELLIS. London. *Lancet* 1921, II, 271-3.—Acid largely regulates the amt. and character of the urine excreted, by its action on the renal tissue. This is largely controlled by the increasing acidity of the blood (acidemia) tending to raise the blood pressure; otherwise the kidneys would not be able to maintain the necessary balance between acid and alkali. This regulation is so delicate that in health the normal variation in blood pressure is not apparent, other causes of increased pressure contributing to its concealment. When impairment takes place owing to breakdown of the chem. balance, general acid sensitiveness occurs, and this condition is accompanied by a rise in blood pressure. If the structure of the renal cells is not injured this is not maintained unless the acidemia continues. If the structure of the cells is injured, the rise of blood pressure is more or less permanent until other forms of compensation are established. When this structural alteration has occurred, acid administration and acid feeding are contra-indicated. E. B. FINK

The catalytic action of light on hemolysis. H. PFEIFFER AND G. BAYER. Innsbruck. *Z. exptl. Med.* 14, 137-219 (1921).—The erythrocytes of various species are

hemolyzed under the influence of light. Within certain limits, the hemolysis is proportional to the intensity of the light. The sensitivity of the corpuscles of different species to light varies. Since the difference in sensitivity is not related to variations in lipid content, it probably represents a true photodynamic action. Photohemolysis may occur in cells stained with eosin if a dil. soln. of eosin is used. Whether light acts upon the cell membrane or the cell itself has not been detd. The sensitivity of the cells of various species to the action of light varies, but this variation does not depend upon differences in lecithin and cholesterol content. Complete hemolysis is not the final effect produced by light; there is in addition, the formation of methemoglobin and the ppts. of a protein combination of blood pigment and eosin which is insol. in H_2O but sol. in alkali. $FeSO_4$ solns. which are not fluorescent aid hemolysis of red cells by eosin. Eosin, under the influence of light, inhibits the action of trypsin and antitrypsin of the serum.

E. B. FRINK

Influence of local inflammation upon the blood. FRIEDRICH KOK. Göttingen. *Z. exptl. Med.* 14, 220-45(1921).—Local burns were used as examples of local inflammations in dogs. Following local burns there is a reduction in sediment vol. of the red blood cells. The reduction is distinct in 24 hrs. and reaches a max. in 4 days, returning to the norm only after wks. No change in reaction upon uterus and intestine strips could be demonstrated with the blood of animals with local burns. Normal dog's blood has a slight constricting action upon the vessels of the rabbit ear. Immediately following a burn there is no change in this reaction, but 24 hrs. later the constricting action is markedly increased.

E. B. FRINK

The influence of Wassermann-positive cerebrospinal fluid upon the action of strophanthin on the frog heart. MAX KASTAN. Königsberg. *Z. exptl. Med.* 14, 282-6(1921).—Cerebrospinal fluid, when it gives a positive Wassermann reaction causes the frog heart to stop more rapidly under the influence of strophanthin. E. B. F.

Is anaphylatoxin characterized by an auto-precipitation phase in the serum? HERMANN DOLD. Frankfurt. *Z. Immunität.* 32, 203-18(1921).—Polemical. Cf. Friedberger and Putter, *C. A.* 14, 1348.

E. B. F.

Anaphylatoxin and serum precipitation. E. FRIEDBERGER AND E. PUTTER. Grieswald. *Z. Immunität.* 32, 218-24(1921).—Polemical in reply to the above. E. B. F.

Cancer as a disturbance in the oxidation of proteins. H. STOLTZENBERG AND M. SROTLZENBERG-REGIUS. *Z. Krebs.* 18, 46-50(1921).—The theory is offered that carcinoma is the result of a disturbance in the enzymes concerned in the oxidizer of proteins whereby irritating by-products are produced which stimulate cell proliferation.

E. B. FRINK

Heterogeneous antigens and haptenes. KARL LANDSTEINER. *Biochem. Z.* 119, 294-306(1921).—L. was able to produce a hemolysin for sheep blood in the rabbit by injecting a mixt. of 2 inactive components, e. g., dild. hog serum and an alc. ext. of the horse kidney.

F. S. HAMMETT

Urinary nitrogen. Mode of action of the calcium sulfate waters (Vittel, etc.) C. PAGE. *Bull. sci. pharmacol.* 28, 368-71(1921).—P. reports having frequently observed a marked increase in the total N-urea N ratio in certain disorders, wher detd. by the hypobromite method. Since at times the urea N found was more than the total N the results and conclusions of this bit of work cannot be taken seriously.

F. S. HAMMETT

Antipneumococcus protective substances in normal chicken serum. CARROLL G. BULL AND CLARA M. MCKEE. Johns Hopkins Univ. *Am. J. Hyg.* 1, 284-300(1921).—The serum of normal chickens is capable of protecting mice and guinea pigs against infection with pneumococci. The protective substances occur in that fraction of the

serum globulin which is insol. in water. The serum contains particular protective substances for each serological type of pneumococcus; and these substances are selectively removed from the serum by the process of bacterial adsorption. "In terms of the protective substances in the chicken serum, Types IIA and IIB pneumococci constitute 2 distinct main groups and Type II strains form a subgroup to both of them." J. S. H.

Study of the natural and acquired antisheep hemolysins of the rabbit as regards thermolability. Roscoe R. HYDE. Johns Hopkins Univ. *Am. J. Hyg.* 1, 346-57 (1921).—The following results were obtained: "(1) The natural hemolysins of the rabbit for sheep corpuscles are as heat resistant as the corresponding immune hemolysins. (2) The apparent difference in the thermolability of the natural and immune hemolysins is due to the relative potency of the sera, the more potent serum apparently being more resistant to heat. (3) Hemolysins are just as resistant to heat when in salt soln. as in undiluted serum."

JOSEPH S. HEPBURN

Reactivation of the natural hemolytic antibody in chicken serum. Roscoe R. HYDE. Johns Hopkins Univ. *Am. J. Hyg.* 1, 358-63 (1921).—The natural hemolysin of chicken serum for rabbit corpuscles can be reactivated with fresh chicken serum and with fresh guinea-pig serum after heat inactivation. The reactivation is accomplished by mixing and incubating the inactivated serum and the complement before adding the corpuscles.

JOSEPH S. HEPBURN

Osteoporosis or osteomalacia of Equidae in the Belgian Congo. R. VAN SAGE-GEN. Bact. Lab. Zambi. *Bull. soc. path. exotique* 12, 238-43 (1919); *Bull. Agr. & Intelligence* 10, 1162-3 (1919).—Osteoporosis is osteomalacia of the *Equidae*. Whenever the disease occurred among the horses and donkeys in the Belgian Congo, the soil of the district was found to be poor in Ca and P, and little or no Ca was present in the water. Not a single case of the disease occurred in districts in which the water contained much Ca. "A proof that the etiological cause of this malady is lack of Ca, not only of the Ca fixed in different forms in foodstuffs, but especially of the Ca in soln. in drinking water, has been established by the fact that the disease has been completely eradicated in a region where it existed under enzootic conditions, by giving horses water to drink which contains $Ca(HCO_3)_2$ in soln." Horses must be more susceptible to lack of Ca, than are the *Bovidae* and other genera which apparently are not attacked by the disease.

JOSEPH S. HEPBURN

Late researches on interstitial gingivitis. EUGENE S. TALBOT. *Dental Cosmos* 63, 795-803 (1921).—A discussion of interstitial gingivitis (pyorrhea alveolaris), its occurrence as a deficiency disease, and its relationship to scurvy. JOSEPH S. HEPBURN

Hemolytic complement—second report. S. INOKI. *Nippon Biseibutsugakkai Zasshi* 6, 389-526 (1918); *Jap. Med. Literature* 5, 25-6 (1920).—Complement from various animals (dog, cat, chicken, horse, man) always can be split into 3 fractions designated the middle, the end, and the third pieces. Any fraction of any of these complements can be substituted for the corresponding fraction of guinea-pig complement without impairment of the hemolytic activity of the recombined complement. A feeble complement is due to deficiency in 1 or more of the 3 fractions. The activity of a given complement is greater when both it and the amboceptor are derived from an animal of the same species than when they are derived from animals of different species. The erythrocyte and the amboceptor first combine, then the complement unites, first its middle piece, next its end piece, and lastly its third piece. Hypertonic saline soln. inhibits hemolysis by prevention of the union of the third piece. In a positive Wassermann reaction, the middle and the third pieces are fixed, while the end piece is unchanged. The decreased complementary power during anaphylactic shock is due to the loss of the middle and the third pieces, the end piece being unchanged. Both the middle and the third pieces, but not the end piece, were required for the production

of anaphylatoxin *in vitro* from a mixt. of antigen, antibody, and complement. A saline soln. of the isolated middle piece deteriorated rapidly, and became antihemolytic by preserving the union of the third piece with the erythrocytes. When complement is inactivated by shaking, mainly the third piece is destroyed, although prolonged shaking also destroys the other two pieces more or less completely. At a temp. of 0°, neither hemolysis nor union of the complement and sensitized erythrocytes occurs when only a small amt. of amboceptor is present. Slight hemolysis occurs when a large amt. of amboceptor is present. The middle piece almost completely combines in 4 hours, while the other two pieces combine but slightly. Therefore attempts to prevent the union of complement and sensitized erythrocytes by keeping their mixt. at a temp. of 0° may not be successful.

JOSEPH S. HEPBURN

Determination of the activity of malleins. E. FAVA. *Nuovo ercolani* 24, 193-8, 209-18 (1919); *Bull. Agr. Intelligence* 11, 68-9 (1920).—Uncertain results are obtained when attempts are made to standardize mallein by its intracerebral injection into guinea pigs. Sp. precipitins are present in the serum of an animal immunized against glanders. These precipitins react with antigens in mallein. Use of this immune serum for a macroscopic precipitin reaction is an easy, simple, and accurate method for the detn. of the toxicity and the activity of com. malleins. The more active the mallein, the greater the degree of diln. of its soln. which still reacts with the immune serum to form a ppt.

JOSEPH S. HEPBURN

Action of colloidal metals upon the properties of complement. FERNAND ARLOING AND LANGERON. *Réunion soc. belge biol.* 1920, 70-1; *Physiol. Abstracts* 5, 432 (1921).—When fresh guinea-pig serum is mixed with prepns. of colloidal metals, it loses its power as complement and no longer produces hemolysis on its addition to an inactive hemolytic system.

JOSEPH S. HEPBURN

Influence of the internal secretions upon tumors of the dog and the mouse. Influence of the internal secretions and of autolysis upon tumors of the rat. V. RENTCHEVSKY. *Réunion soc. belge biol.* 1920, 71-7; *Physiol. Abstracts* 5, 423 (1921).—Malignant tumors, which have been inoculated into animals, grow more rapidly if O_2 or more of the ductless glands (gonads, thyroid, thymus, spleen) be removed at the same time. Injection of a suspension of the tissues of the ovary or the testicle, or feeding with the thymus or the thyroid retards the growth and promotes absorption of the tumor. The conclusion is drawn that the condition of the glands of internal secretion perhaps is an important factor in determining the origin of tumors, their malignant development, and the individual reaction of the organism toward them.

JOSEPH S. HEPBURN

Resistance of mice to cancer after repeated injections of heated cancerous tissue. LÉON KÉPINOW. *Réunion soc. belge biol.* 1920, 77-9; *Physiol. Abstracts* 5, 433 (1921).—When the boiled emulsion of cancerous mouse tissue was injected into the abdominal cavity of mice, it produced immunity in 80% of the exptl. animals against subsequent inoculation with cancerous tissue. Inoculation produced cancer in 100% of the control animals.

JOSEPH S. HEPBURN

Study of the union *in vitro* of blood platelets and foreign erythrocytes. P. GOVAERTS. *Réunion soc. belge biol.* 1920, 150-1; *Physiol. Abstracts* 5, 404-5 (1920).—Rabbit platelets do not combine with sheep erythrocytes in the presence of physiol. saline; and sheep erythrocytes agglutinate in sheep plasma only when the platelets are added. Anti-sheep hemolytic rabbit serum sensitizes sheep erythrocytes and greatly increases their susceptibility to the natural opsonic action of rabbit plasma, but it apparently lacks acquired, thermostable (tropin) opsonic properties capable of influencing the erythrocytes in such a manner that the platelets become able to unite with the red cells in a physiol. saline soln. or in a medium free from complement.

J. S. H.

Leucocytic exudates and transmissible microbial autolysis: The bacteriophage

of Herelle, its production and its interpretation. J. BORDET AND M. CIUCA. *Réunion soc. belge biol.* 1920, 1293-5, 1296-8; *Physiol. Abstracts* 6, 91(1921).—By the action of a leucocyte exudate obtained from an animal vaccinated with a definite strain of *B. coli*, organisms of that strain acquire a marked power to undergo autolysis. They then secrete into the medium a lysis which is autorenewable and is transmissible in a series of new emulsions of the normal *B. coli* of the same strain as that used in the vaccination of the exptl. animals. Different views exist as to the nature of this lysis, e. g., a living bacteriophage virus, an enzyme of bacterial origin detached by a catalyst of intestinal origin. B. and C. consider the lysis to be of leucocytic origin and to be in harmony with the defensive mechanism of the body. Organisms which resist autolysis grow slightly in this bouillon and confer the transmissible lytic power upon it. After several transplantations upon gelose, the organisms produce a luxuriant, glairy growth which differs markedly in appearance from that of the original, normal *B. coli*. When the organisms are transplanted into bouillon, they confer upon it the same transmissible lytic power. Since the organisms are less capable of undergoing phagocytosis than normal *B. coli*, they are more toxic for the guinea pig. After passage through the blood of a guinea pig, they retain their cultural characteristics as well as their power to secrete a transmissible lysis. Death was produced by the introduction of 1 cc. of lytic culture of *B. coli* into the peritoneum of a guinea pig 15 min. after a lethal dose of the normal organism.

JOSEPH S. HEPBURN

Loss of age of the Bordet-Wassermann reaction in certain syphilitic sera. E. RENOUX. *Réunion soc. belge biol.* 1920, 1298-9; *Physiol. Abstracts* 6, 90(1921).—Several syphilitic sera, which had given a positive Bordet-Wassermann reaction after heating at a temp. of 56°, were kept at the temp. of the room for 2 or 3 years. They then gave a negative Bordet-Wassermann reaction, but completely regained their power to fix complement when they were heated for a second time for 10 min. at a temp. of 56°.

JOSEPH S. HEPBURN

Adsorption of the active principle of the Bordet-Wassermann reaction by precipitated globulins. E. RENOUX. *Réunion soc. belge biol.* 1920, 1299-1302; *Physiol. Abstracts* 6, 91(1921).—A syphilitic serum was稀释 with distd. water, and the globulin pptd. by passing CO₂; the active principle of the Bordet-Wassermann reaction passed very irregularly into the globulin. However, it was completely adsorbed by the ppt. if lipins (Bordet-Ruelen antigen) were added to the稀释 serum prior to the passage of CO₂. The same phenomena occurred when use was made of a syphilitic serum which had lost its power to fix complement through age. In order to demonstrate the adsorption, the pptd. globulin had to be heated for 10 min. at a temp. of 56°. J. S. H. H. Action of hirudin in vitro and in vivo upon the toxic action of serum treated with agar. E. ZUNZ AND MARTHE VAN GEERTRUYDEN. *Réunion soc. belge biol.* 1920, 1561-3; *Physiol. Abstracts* 6, 36(1921).—Under the proper conditions, hirudin attenuates, in vivo and in vitro, the toxicity for the guinea pig of serum, which has been treated with agar. Treatment with agar makes hirudinized plasma but little, if at all, toxic for the guinea pig, but confers on oxalated plasma the ability to produce the symptoms of anaphylactic shock and death.

JOSEPH S. HEPBURN

Production of antibodies. J. MAISIN. *Réunion soc. belge biol.* 1920, 1575-6; *Physiol. Abstracts* 6, 90(1921).—Study of the agglutinins and hemolysins in the rabbit demonstrated that the production of antibodies is greater in animals which receive repeated injections than in animals which receive only one injection, even though the total of the doses of antigen given in several successive injections be but a fraction of the single dose given to the animals receiving but one injection. JOSEPH S. HEPBURN

Function of denervated kidneys. O. M. PICO. *Soc. biol. Buenos Aires* 1920, June 10; *Physiol. Abstracts* 5, 313(1920).—The excretion of water, urea and chlorides

under normal conditions and after intravenous injection of NaCl or Na₂SO₄ was detd. in dogs both prior to, and after enervation of the kidneys. Enervation increased the excretion of water, and considerably increased the excretion of NaCl, but exerted no influence on the excretion of urea; Na₂SO₄ restored the excretion of NaCl to its normal value prior to enervation. The exptl. animals lived for several months and apparently were healthy; and the urea and chlorides in their blood did not undergo any changes.

JOSEPH S. HEPBURN

Polyuria on cerebral puncture in the normal dog and in the dog deprived of the hypophysis. B. A. HOUSSAY, J. E. CARULLA AND L. ROMAÑA. *Soc. biol. Buenos Aires, Rev. Assoc. Med. Argentina* 32, 41(1920); *Physiol. Abstracts* 5, 480(1921).—A polyuria, generally of short duration, was produced in 12 dogs on puncture with a red hot needle of the base of the cerebrum in the region between the optic commissure and the protuberance. The same phenomenon was produced in 4 dogs in which the needle was permitted to remain in place. Polyuria did not always occur in lesions of this region, but never occurred in cases of puncture outside this region. Atrophy of the genitalia took place only when a severe lesion of the hypophysis was produced. The polyuria was primary and not dependent upon the polydipsia; and was not due to either the glucosuria or the variations in the blood pressure. The polydipsia was a secondary phenomenon.

JOSEPH S. HEPBURN

Polyuria on cerebral puncture of dogs with denervated kidneys. B. A. HOUSSAY AND J. E. CARULLA. *Soc. biol. Buenos Aires, Rev. Assoc. Med. Argentina* 32, 51(1920); *Physiol. Abstracts* 5, 480(1921).—Dogs, in which the kidneys had been denervated bilaterally several weeks previously, showed polyuria in 4 of 10 exptl. animals, when puncture was made in the region, lesions of which produce polyuria. See preceding abstract.

JOSEPH S. HEPBURN

Nitrogen partition in the urine in chronic under-nutrition. K. KOHN. *Wiener klin. Wochschr.* 33, 1027-30(1920); *Physiol. Abstracts* 5, 553(1921).—In chronic under-nutrition, the N metabolism is reduced quantitatively; qual. changes do not occur with the exception of a slight increase in NH₃ and hippuric acid. The oxy-protein acids do not increase. Intensive adaptation of the body to a minimum of protein partially inhibits the destruction of the body cells.

JOSEPH S. HEPBURN

The pathogenesis of gout. GUDZENT, WILLE AND KEESEER. *Univ. Berlin. Z. klin. Med.* 90, 147-70(1920).—A uremia may occur in many unrelated diseases. It is present in typical gout which is clinically recognized; but the uric acid content of the blood may be either normal or even subnormal in many cases, especially of acute gout, and therefore has only a very limited value for diagnostic purposes. In health, injected urates are excreted up to 100%. In typical gout, a retention of mono Na urate occurs in the tissues, up to 90% in severe cases. Hence supersatd. urate solns. are formed in the tissues, probably by predilection in certain regions. The supersatn. and the toxic action of urates explain the formation of deposits of urates and the occurrence of acute attacks of gout. In addition to gout, a series of diseases, such as tabes, old age, mild tuberculosis, alcoholism, and glomerular nephritis, show a certain, though far less marked, retention of urates after the intravenous injection of mono Na urate. Patients suffering from these diseases have the same concn. of urates in the blood and the tissues, while patients suffering from gout show a concn. of urates essentially higher in the tissues than in the blood. It is suggested that certain types of urate retention may be due to a specific disease of the capillaries.

JOSEPH S. HEPBURN

The reaction of the blood in secondary anemia. C. L. EVANS. London. *Brit. J. Exptl. Path.* 2, 105-114(1921).—Although the immediate effect of hemorrhage is a lowering of the alkali reserve of the blood, the response of the respiratory centers may partially compensate, or even over-compensate, for this change, so that the cir-

culating blood may be either more acid, or less acid, or of the same reaction even after as before the hemorrhage. After 12 hrs. the reduction in alk. reserve is compensated, owing to increased excretion of acid by the kidney; subsequently the alk. reserve of the blood may become higher than the normal and remain at this level until the corporcular regeneration is complete. The response is a protective one against acidosis. H. F. H.

The retention of residual nitrogen in infectious diseases. F. WAGNER. Vienna. *Wiener Arch. inn. Med.* 1, 575-638(1920).—Any acute febrile condition may lead to an azotemia. In chronic febrile conditions there usually is no azotemia. The increase of the urea fraction in the blood is independent of the height of the body temperature, apparently independent of the condition of the kidney, but probably dependent on the degree of intoxication. There are marked differences in the intensity of action of the different pathogenic organisms or their toxins on the urea increase in the blood. Parallel with the increase of the urea in the blood there is generally an increase of urea excretion through the kidneys, often with accompanying nephritis. A high urea value (over 100 mg. in 100 cc. blood) need not be considered a bad sign especially if of short duration but an azotemia of long duration indicates a bad prognosis. H. F. H.

Remarks on the article of Fritz Wagner on the retention of residual nitrogen in infectious diseases. W. FALTA. *Wiener Arch. inn. Med.* 2, 187-8(1921); cf. preceding abstr.—Falda agrees with the findings of Wagner of an azotemia in infectious diseases but does not accept his conclusion that the retention of urea is independent of the kidneys and due to an excessive breaking down of body protein. By way of the alimentary tract an even larger amt. of residual N may be brought to the kidneys than could be produced in an infectious disease by the breaking down of body proteins, without leading to the accumulation in the blood of the enormous amts. of residual N characteristic of some infectious diseases, the normal kidney promptly eliminating the N excess.

HARRIET F. HOLMES

Study of chlorine metabolism in histogenous edema. Criticism of the constants of Ambard. E. MALISOA AND ECKERT. *Wiener Arch. inn. Med.* 2, 16-44(1921).—In a series of cases of hunger osteomalacia, edema appears before bone symptoms. This edema is not cardiac or renal but probably the expression of hypothyroidism as is the decreased functional activity of other endocrine glands. Study of Cl metabolism in these and other forms of edema shows that the relation between Cl concn. in the serum and Cl excretion in the urine as expressed in Ambard's law does not hold here. The threshold of secretion for the Cl concn. in the serum as expressed by Ambard's formula is here of no value. The autonomous need of Cl by the tissue is the detg. factor. The laws of Ambard only hold for a moderate equil. between the avidity of the tissues for Cl and the Cl concn. in the serum. In edema this relation is disturbed but on recovery there is a return to the condition expressed by Ambard's laws. (Cf. Ambard and Moreno, *Semaine méd.* 1911; Ambard and Weill, *Semaine méd.* 1902.) HARRIET F. HOLMES

The iodine number of urine. OSKAR WELTMANN. Vienna. *Wiener Arch. inn. Med.* 2, 107-20(1921).—All urines contain a substance with an affinity for I. To 10 cc. urine add 0.5 cc. 1% starch and 5 cc. 0.05*N* I soln. and titrate at once with 0.05*N* Na₂S₂O₃ soln. until the normal color of the urine returns, or in some pathol. urines until there is a distinct change of color. The reaction is very sharp. The % I no. of the urine is the amt. of I bound by 100 cc. urine and the abs. I no. the amt. reckoned for the urine of 24 hrs. The % I no. normally varies directly with the sp. gr. and inversely with the amt. of the urine. When the I no. and the sp. gr. show wide variation, a relatively high I no. indicates extra-renal factors and a relatively low I no. a severe injury to the kidney. High I nos. have been noted in certain diseases of the liver, acute febrile conditions and certain rapidly progressing malignant neoplasms. HARRIET F. HOLMES

Pathology of famine edema. O. WELTMANN. Vienna. *Wiener Arch. inn. Med.* 2,

121-40(1921).—Three cases of famine edema showed symptoms indicating pancreatic insufficiency as diarrhea, steatorrhea and kreatorrhea. The duodenal juice showed almost no tryptic activity and a marked reduction in lipolytic and amylolytic activity. Autopsy showed a marked atrophy of the pancreas. Alimentary deficiency in persons of weak constitutions increases the hypopancreatism and a vicious circle results. Death resulted in spite of a change to suitable nourishment. **HARRIET F. HOLMES**

The influence of hypertonic salt solution on hemoglobinuria due to cold. **S. BONDY AND R. STRISOWER.** Vienna. *Wiener Arch. inn. Med.* 2, 141-54(1921).—A description is given of 2 cases of paroxysmal hemoglobinuria due to cold, which were greatly improved by injections of hypertonic salt soln. in the form of a 6% soln. contg. equal amts. of Na_2HPO_4 and NaCl . Amboceptor and complement were unaltered after the injections but the resistance of the red blood corpuscles to hypotonic salt soln. was increased. Immediately following the injections, there was a decrease in the no. of red blood cells, followed by an improvement in the blood findings. **H. F. H.**

Complement fixation reaction in tuberculosis (antigen of Besredka). **J. RIZUX AND MME. BASS.** *Ann. inst. Pasteur* 35, 378-87(1921).—75% of 156 cases of tuberculosis, pulmonary, peritoneal, pleural and glandular, and 64% of 80 cases of supposed latent tuberculosis reacted positively in complement fixation test with the antigen of Besredka, and 87.5% of 148 cases, where it was thought tuberculosis could be excluded, reacted negatively. **E. R. LONG**

Complement fixation reaction with Besredka's antigen in surgical tuberculosis. **B. FRIED AND M. MOSER.** *Ann. inst. Pasteur* 35, 388-95(1921).—Contrary to the usual opinion that humoral antibodies are found only in visceral tuberculosis, the authors find a high percentage of cases of bone, joint and gland tuberculosis reacting positively with Besredka's antigen, while the majority of non-tuberculous bone lesions, as rickets and syphilis, failed to do so. In cases of surgical tuberculosis where the process was limited by scar tissue the reaction was usually negative. Also in *Press. med.* 29, 436-7 (1921). **E. R. LONG**

The alkali reserve of blood plasma during acute anaphylactic shock. **A. A. EGGERSTEIN.** Manhattan Eye, Ear and Throat Hosp. and Columbia Univ. *J. Lab. Clin. Med.* 6, 555-60(1921).—Rabbits are unsatisfactory for a study of the changes of the CO_2 capacity of the plasma in acute anaphylactic shock, because of their marked normal variations from day to day, and because anaphylaxis in rabbits is usually not acute. Acute shock in dogs is associated with an immediate and progressive acidosis, which appears before recognizable clinical symptoms of shock. When the CO_2 capacity of the blood plasma falls below 25% the animal usually dies. The acidosis is quickly relieved after shock if the animal survives, the alkali reserve returning to normal in less than six hours. The administration of NaHCO_3 to dogs before anaphylactic shock has an apparent beneficial influence upon the recovery of the animals. However, it will not always prevent death even though the alkaline reserve of the plasma is restored to normal or above. Alkaline treatment of guinea pigs preliminary to acute anaphylactic shock reduced the mortality 16.7% in a series of animals treated with relatively large doses of NaHCO_3 intravenously and a minimum lethal dose of the sensitizing protein. **E. R. LONG**

Studies on the resistance of the red blood cells. III. The relation of cholesterol to the resistance of the red blood cells to the hemolytic action of sapotoxin. **CHAS. H. NELSON AND HOMER WHEELON.** St. Louis Univ. *J. Lab. Clin. Med.* 6, 568-78 (1921); cf. *C. A.* 15, 3141.—The red cells may be considered as composed of jellies which depend for their existence upon their content of lipins. The cholesterol content of their environment is the most important element in their protection against sapotoxin. A chem. examn. of the blood for cholesterol is therefore to be greatly preferred to

the more laborious and inaccurate task of estg. the red cell resistance to hemolytic agents.

E. R. LONG

The gastric juice in pancreatic diabetes. M. E. STEINBURG. Univ. Chicago and Univ. Oregon Med. School. *Am. J. Physiol.* 56, 371-9 (1921).—After total pancreatectomy, in dogs with Pavlov stomach pouches, the gastric juice from the pouch of the fed dog is normal in acidity, and considerably above normal in pepsin. Gastric secretion in the depancreatized dog is considerably delayed and prolonged. The total gastric secretion is about double that of the normal dog. The stomach empties slowly. A severe gastritis, with constant retching and vomiting, was noted. The continuous secretion from the pouch was low in acid but high in pepsin. J. F. LYMAN

Effect of muscular work upon blood and urine sugar in diabetes. M. BÜRGER. *Arch. exptl. Path. Pharm.* 87, 233-92 (1920).—The detns. show that muscular activity induces much more marked fluctuations in the blood sugar of diabetics than in normal individuals. In fact, a marked increase in blood sugar as the result of bodily exertion is pathognomonic for diabetes. Several factors contribute to the production of the "exertion" hyperglycemia, the most important being the glycogen content of the liver. This is indicated by the fact that untreated cases of diabetes react to work with a more intense hyperglycemia than do cases which have received dietetic treatment. In an individual case the type of reaction is associated with the character of the diet on the day of the detns., whether it is of a high or low carbohydrate value. Moreover, the type of diabetes is also important; a higher reactivity is obtained in severe cases of diabetes in young persons than in cases which have been long established. Irritability of the nervous system is also a determining factor; women react more strongly than men; "nervous" diabetics more actively than "phlegmatic." The degree of glucosuria exhibited appears to be relatively free of the sugar content of the plasma. Exertion hyperglycemia in diabetics without glucosuria is perhaps the result of a hasty mobilization of glycogen and an abrupt discharge of the glycogen from the liver, caused by the stimulus afforded by muscular activity. This deprivation of the liver in glycogen reacts in turn upon the mechanism regulating sugar elimination by the kidney, rendering the latter organ more impermeable. Tolerance in an individual to carbohydrate should be differentiated from tolerance of a kidney to sugar. G. H. S.

Relation between hyperglycemia and glucosuria in experimental adrenaline diabetes. FRITZ HILDEBRANDT. *Arch. exptl. Path. Pharm.* 88, 80-112 (1920).—Repeated detns. of sugar in both blood and urine were made in rabbits showing exptl. adrenaline diabetes. In different animals the degree of hyperglycemia varied considerably, apparently because of initial variations in the amt. of glycogen which was present in the liver and the other carbohydrate depots. Glucosuria never occurred with a blood sugar of less than 0.2%, and when it did occur with higher blood sugar values the amt. eliminated depended largely upon the diuresis; the more marked the diuresis the greater the abs. amt. of sugar in the urine. The glucosuria was proportional to the hyperglycemia. The daily injection of adrenaline did not appear to alter the permeability of the kidney to sugar. G. H. S.

Hydrochloric acid concentrations after resection of the stomach for *ulcus callosum*. HANS KLOIBER. *Med. Klin.* 17, 38-9 (1921).—In 15 cases HCl detns. were made upon the gastric contents before and after resection of the stomach. In general, both the free HCl and the total acidity were greatly decreased after the operation. Av. detns. for the 15 cases showed that the free acid was decreased from 23 to 1.8 and the total acidity from 50 to 7. G. H. S.

Biliary obstruction required to produce jaundice. PHILIP D. McMaster AND PEYTON ROUS. Rockefeller Inst. Med. Research. *J. Exptl. Med.* 33, 731-50 (1921).—The bile ducts from 75% of the liver substance in dogs and monkeys can be obstructed

without any clinical evidence developing of pigment or cholate accumulation in the organism. In the dog 95% of the liver substance can be placed in stasis without the occurrence of tissue icterus such as regularly follows total obstruction in this animal. The plasma of the dog and monkey, unlike that of man, is normally free from bilirubin and this pigment so readily escapes from the blood into the urine that bilirubinuria is often to be found in the dog in the absence of bilirubinemia, while the latter is never met with alone in either animal. It follows that in both species the renal threshold for bilirubin is much lower than in man—if indeed one can be said to exist at all. The amt. of biliary obstruction required to produce jaundice in human beings is probably as great as in the exptl. animals with which M. and R. have dealt. The clinical jaundice encountered in association with local liver lesions should be viewed not as the result of local bile resorption but as due to a general injury to the hepatic parenchyma or ducts or to blood destruction.

C. J. WEST

Study of transfused blood. I. The periodicity in eliminative activity shown by the organism. II. Blood destruction in pernicious anemia. WINIFRED ASHBY. Mayo Foundation. *J. Exptl. Med.* 34, 127-46, 147-66 (1921).—Evidence is presented to show that there is no hemolytic toxin producing the anemia in pernicious anemia. The periods of active blood destruction which are seen as the exception in pernicious anemia cases during a series of transfusions are due to the activity of the blood-destroying organs of the body rather than to the intrinsic weakness of the pernicious anemia blood corpuscle. It is questionable whether blood destruction is as important a factor in producing the anemia of pernicious anemia as it is at present usually assumed to be.

C. J. WEST

Studies on the pneumonic exudate. I. Effect of preservation, temperature, dialysis, and salt concentration on the enzyme in the pneumonic lung. FREDERICK T. LORD AND ROBERT N. NYE. Mass. Gen. Hospital. *J. Exptl. Med.* 34, 199-200 (1921).—The enzyme present in the pneumonic lung exudate still remains active after preservation for 18 months. It is active at incubator temp. before and after heating to 65° for 1 hr. It is slightly active at room temp. and inactive after heating at 75° for 1 hr. Dialysis of the enzyme is not demonstrable. Activity persists when the enzyme is mixed with concns. of NaCl varying from *N* to 32 *N*. II. Presence of enzyme and antienzyme in the pneumonic lung. Local ferment-antifерment balance. *Ibid* 201-3. III. The presence in the pneumonic exudate of a large amount of specific antigen. *Ibid* 207-9. In lobar pneumonia due to the fixed types of pneumococci a specific precipitin reaction is obtained when the pneumonic exudate is mixed with the homologous antipneumococcal serum. IV. The presence in the pneumonic lung of a soluble substance inhibiting agglutination by the homologous serum. *Ibid* 211-6. Specific agglutinins for the homologous pneumococcus are lacking or present only in small amt. in the pneumonic exudates owing to the fixed types of pneumococci. Suspensions of fixed types of pneumococci in the supernatant fluid obtained after centrifuging the mash of the pneumonic lung give positive agglutination tests in dilns. not higher than equal pts. of suspension and supernatant fluid (1:2). The pneumonic lung contains a sol. substance inhibiting agglutination of the fixed types of pneumococci by the homologous antipneumococcus serum.

C. J. WEST

Epinephrine hyperglycemia. I. ARTHUR L. TATUM. Univ. Chicago. *J. Pharmacol.* 17, 395-413 (1921).—Epinephrine causes, on subcutaneous injections in adequate amt., a fall in alkali reserve capacity in normal animals. This points to acidosis as causative. This is supported by the failure of hyperglycemia from dextrose injections to cause a considerable fall in reserve. On the other hand, when the alkali reserve is greatly lowered by other means, such as in acidosis from phlorhizin or by gastric administration of strong acids, epinephrine still exerts its usual glycogenolytic activity

without further change in the alkali reserve capacity. That the drug is acting is proved by the hyperglycemia induced. If acidosis within the liver is causative and is induced by hepatic vasoconstriction such that a very marked fall of reserve occurs in normal animals, it would be expected that an equiv. acid production should occur when acidosis pre-exists. Expts. are reported which seem to eliminate the respiratory center from responsibility for the lowering of alkali reserve capacity. The above data together with that in the literature force the conclusion that epinephrine glycogenolysis cannot be satisfactorily explained on the basis of hepatic asphyxia or acidosis. The mechanism of epinephrine mobilization of carbohydrates therefore is as yet undtd. C. J. WEST

WELLS, HARRY GIDEON: *Chemical Pathology*. Philadelphia: W. B. Saunders Co. 4th Ed. revized and reset. 695 pp. \$7.00.

H—PHARMACOLOGY

ALFRED N. RICHARDS

The correlation between the chemical composition of anthelmintics and their therapeutic values in connection with the hookworm inquiry in the Madras Presidency. VII. *Oleum eucalypti*. J. F. CAIUS AND K. S. MHASKAR. *Indian J. Med. Research* 8, 372-8 (1920); cf. *C. A.* 15, 1159.—Eucalyptol ranks low as an anthelmintic and cannot be recommended for use in the eradication of the hookworm infection. VIII. Chloroform. *Ibid* 378-83. Pure CHCl_3 in combination with castor oil ranks high as an anthelmintic against hookworms. IX. The eucalyptus-chloroform mixture. *Ibid* 384-91. In the doses usually prescribed eucalyptus is superfluous. H. V. ATKINSON

An inquiry into the correlation between the chemical composition of anthelmintics and their therapeutic values in connection with the hookworm inquiry in the Madras Presidency. J. F. CAIUS AND K. S. MHASKAR. *Indian J. Med. Research* 8, 737-40 (1921).—A progress report. Hydrocarbons, polyhalides, ales., aldehydes, ketones, and alkaloids have failed to exhibit anthelmintic properties; narcotics, associated with a purgative, may prove efficient drugs for the expulsion of hookworms; anthelmintic properties have been met with in oxides, peroxides, and phenols; oxides have weak vermicidal, but no vermisugal properties; the anthelmintic power associated with the phenolic group may be partially or wholly inhibited by the presence of substituting radicals in the benzene nucleus; the highest anthelmintic power has been found in monophenols of di-substituted benzene compds. H. V. ATKINSON

Trinitrotoluene as an industrial poison. ALICE HAMILTON. *J. Ind. Hygiene* 3, 102-16 (1921).—A summary of the observations of medical students assigned to 6 typical TNT plants during the summer of 1918. H. considers that the results are of interest not only in connection with TNT plants, but in peace-time industries in which similar derivs. of $\text{C}_6\text{H}_5\text{NO}_2$ are handled. Plants 1 and 2 were in New Jersey, unclean, crowded, poorly ventilated and subject to inefficient medical inspection. Plant 3, loading shell with amatol (TNT + NH_4NO_3) in New Jersey, was new, clean, and well constructed, but medical supervision was deficient. Plant 4 was partly new, partly old, construction, and was crowded; it employed negroes and Southern whites. Medical care was very good. Plant 5, Wisconsin, was for nitrating, purifying, and packing DNT and TNT; employees were of a good class and medical care was good but not sufficient. Plant 6, Pennsylvania, was a "finishing" plant; good medical care but no preventive work; negroes and whites. Briefly summarized the findings are as follows: *Mode of entrance of TNT* is chiefly through the skin, and therefore protection of the worker against contact is important. Other recommendations are: elimination of hand work, cleanliness of plant and app., freedom from dust, clean working clothes, ample washing facilities. Fumes from melting pots and steam from washing and pelleting

also cause poisoning, but serious cases are not generally due to fumes alone. Hot humid weather increases poisoning but does not increase dermatitis. *Influence of race:* Negroes are not susceptible to TNT dermatitis, and may be less susceptible to systemic poisoning than whites. *Influence of age:* Young men are more susceptible than mature men. "It seems poor economy to employ them." *Time of exposure before TNT can be detected in the body:* often a few hours after first starting work, but serious symptoms do not develop. Serious cases show breathlessness, headache, dizziness, dullness, weakness, livid face, blue lips. The effect of EtOH on poisoned men was very marked, moderate amounts causing intense feeling of heat, rush of blood to the head, blackness before the eyes, and unconsciousness. *Period of elimination* was a few days, where the worker was taken off TNT work, and given vigorous eliminative treatment. Simply to transfer him to less dangerous work postponed recovery over long periods. *Comparative danger of pure, crude, and mixed TNT:* Crude TNT produces more dermatitis than pure, as does amatol, but data on systemic poisoning are not conclusive. The *Webster reaction* is a rapid and delicate test for absorbed TNT, based on the color reaction of a reduction product occurring in the urine. Details are not given. (Cf. B. Moore, *C. A.* 12, 954.) It is not necessarily a criterion of the extent of poisoning, but may act as a guide in showing that the elimination of poison is decreasing with consequent increase in the body, and greater severity of symptoms. The color changes in the untreated urine, varying from light brown and red to coffee-colored, seem to have greater clinical value than the Webster reaction. The blood exams. of Minot (*C. A.* 14, 575) show that this method also is one of diagnostic value. References to recent literature are given.

H. W. BANKS, 3D.

The action and uses of kaolin in the treatment of Asiatic cholera. RONALD R. WALKER. *Lancet* 1921, II, 273-6.—The action of kaolin is both mechanical and adsorptive. (1) Mechanical: The administration of such large quantities of kaolin as are used in the treatment of cholera almost fills the bowel, and the passage of this mass through the bowel must enclose and carry with it a large number of bacilli. It has, however, no bactericidal effect. The fact that kaolin forms an adherent coating to the walls of the bowel points to its usefulness in ulcerative forms of colitis. (2) Adsorptive: This, the chief function of kaolin, is very marked; its extremely fine state of division lends itself to that end. In the case of cholera and probably in diphtheria, ptomaine poisoning, bacillary dysentery and general toxic conditions, kaolin has a wide range of use.

E. B. FINK

Chemotherapeutic studies with fats of acid-fast bacilli. AD. LINDBERG AND BRUNO RANGEL PESTANA. Brazil. *Z. Immunit.* 32, 66-86 (1921).—Chaulmoogra oil and many other oils, because of their content of unsatd. fatty acids, have an inhibitory action upon cultures of tubercle bacilli and other acid-fast organisms. This probably accounts for the therapeutic efficiency of chaulmoogra oil in leprosy and cod-liver oil in some cases of tuberculosis. These oils act as direct chemotherapeutic agents and not as stimulators of phagocytosis. The chaulmoogra oils obtained from Taraktogenus Kurzii are not only most efficient therapeutically in the treatment of leprosy, but possess the greatest inhibitory power against cultures of acid-fast organisms. The activity of the oil is due to the unsatd. acids, but not all these acids possess the same degree of activity. Cultures of lepro and tubercle bacilli also contain unsatd. fatty acids. It is therefore wrong to attribute the activity of the fatty acids to the action of the unsatd. fatty acids alone. It is possible that the activity is proportional to the number of double bonds in the acid mol., or it must be assumed that the active oils contain an unknown, unsatd. fatty acid, or a homologous unsatd. fatty acid, not yet isolated.

E. B. FINK

The action of chloroform on the blood plasma of birds. P. NOLF. *Arch. intern.*

physiol. 16, 374-447(1921); cf. *C. A.* 15, 2504.—The lengthy study concerns itself with the effect of CHCl_3 on the formation of thrombin, on the phosphated and oxalated plasma, and on the antithrombin of the blood plasma of birds. The results indicate that notwithstanding the extreme stability of avian plasma as regards the phenomenon of clotting, it yet contains all the elements of fibrin and thrombin. It fails to coagulate spontaneously, not because an essential constituent is lacking, but because the quant. relation between the tendencies which favor and those which retard coagulation are on the side of the latter. CHCl_3 does not bring about coagulation through the destruction of any anti-coagulating principle. The actual influence of CHCl_3 is towards a facilitation of coagulation resulting from the production of large amts. of thrombin. At the same time that the fibrin and the thrombin are being formed the antithrombin and antithrombolytin tend to disappear in the same degree. It appears as if CHCl_3 intensifies to a great degree the reaction capacity of a factor essential for coagulation which N. has called "thrombozyme." During the process of coagulation there occurs an intense proteolysis.

F. S. HAMMETT

Blood gas analyses. IX. Narcosis and colloidal charge. KLOTHILDE MEIER AND W. KRÖNIG. *Biochem. Z.* 119, 1-15(1921).—Continuing previous studies (cf. *C. A.* 15, 1751) results are reported of the effects of methylurethan, ethylurethan and EtOH in 0.85% NaCl soln. on the CO_2 absorption curve of washed red blood corpuscles when titrated with CO_2 , as an index of the action of narcotics on the elec. charge of the cell membrane colloids. The observations which are reported in 32 tables lead to the conclusion that the substances employed facilitate the discharge of the plasma colloid membrane. When physiol. saline alone is used this effect occurs at a p_{H} of 6.67. Methylurethan in optimum concn. causes it to take place at $p_{\text{H}} = 6.95$ while with ethylurethan and EtOH it occurs at p_{H} of 6.90 and 6.85, resp. This effect takes place at the same concns. at which a narcotic action is found.

F. S. HAMMETT

The effect of intravenous sugar injections on the blood sugar, the number of red blood corpuscles and the excretion of lactic acid. V. DE MORACZEWSKI AND EGON LINDNER. *J. physiol. path. gén.* 18, 202-13(1921).—The intravenous injection into the human subject of 50 g. of dextrose produces an elimination of 15% of the injected sugar within 12 hrs. and an increase in the lactic acid and a diminution of the P urinary excretion. No influence on the temp. or blood picture was observed. A similar injection of levulose gives rise to an elimination of 10 to 14% of the administered sugar, increases the amt. of lactic acid, diminishes the amt. of P excreted, and causes a rise in temp. of both normal and pathological individuals. The white corpuscles of the blood diminish. If adrenaline is given simultaneously with the sugar, the excretion is retarded and the blood sugar raised. If phlorhizin is given there is an increase in the sugar excretion of 10% over the norm after sugar injection. Anemic individuals seem rather indifferent as far as the temp. reaction is concerned. When dextrin is given the reaction is about the same but a bit longer in its duration.

F. S. HAMMETT

The chemical sensitivity of the endings of the pulmonary vagus. A. PI SUNER AND J. M. BELLIDO. *J. physiol. path. gén.* 19, 214-15(1921).—Tracings are recorded of the effect on the respiratory movements of the breathing of CO_2 by a dog so prepd. that the inspired gas did not reach the nervous centers. The results indicate an influence of CO_2 on the terminal endings of the pulmonary branches of the vagus.

F. S. H.

The pharmacology of alcohol and its influence on metabolism. JACOB DINER. *Med. Record* 100, 273-5(1921).—Expts. are briefly reported tending to show that small amts. of EtOH increase the heart beat while large amts. cause a slowing. In a test of its effect on cerebral activities the evidence pointed to a stimulation to rapid action with decreased accuracy. In 4 cases of diabetes the blood sugar was reduced by the administration of 4 cc. of EtOH for a period of 8 days.

F. S. HAMMETT

The effect of alcohol upon the endocrines. CHARLES E. DEM. SAJOUS. *Med. Record* 100, 280-4(1921).—Mainly of clinical interest. F. S. HAMMETT

Contraction curve produced by caffeine in normal muscle and in fatty degenerated muscle. A. AMATO. *Arch. fisiol.* 17, 33-45(1918-19); *Physiol. Abstracts* 5, 394(1920).—When a muscle is exposed to the action of caffeine solns., contraction is produced. The contraction occurs more rapidly and more readily in muscles which are undergoing fatty degeneration than in normal muscles. JOSEPH S. HEPBURN

Action of veratrine on the isolated ureter. A. ROSSI. *Arch. fisiol.* 17, 99-103 (1918-19); *Physiol. Abstracts* 5, 421(1920).—Various doses of veratrine were added to Ringer soln. in which an isolated guinea-pig ureter was placed. Very small doses increased the tonicity; the increase varied with the dosage. Changes in rhythm were produced; either the rate of contraction was increased, or contraction was started if it had not yet begun. The single contractions were modified in the same manner as this alkaloid modifies those of striated muscle. JOSEPH S. HEPBURN

Synthesis of diethyl ethylcaffinemalonate, and a preliminary pharmacological study of the new compound. M. AIAZZI-MANCINI. *Arch. fisiol.* 17, 137-46(1919); *Physiol. Abstracts* 5, 430(1920).—This compd. was prep'd., and its action on the muscles, heart and spinal cord of frogs and guinea pigs was detd. The physiol. action was essentially that of caffeine, but this action was so "denatured," especially with respect to the central nervous system, that the depressive effects prevailed over those of excitation. JOSEPH S. HEPBURN

Behavior of creatine on perfusion through the surviving liver. V. SCAFFIDI. *Arch. fisiol.* 17, 147-58(1919); *Physiol. Abstracts* 5, 419-20(1920).—Creatinine was not formed when a soln. of creatine in Ringer soln. was perfused through the surviving dog liver for periods as long as 6 hours. A noticeable amt. of creatine was consumed by the liver; this consumption was most marked at the beginning of the perfusion, and gradually decreased. The amt. consumed was proportional to the amt. perfused up to a certain point, but steadily decreased toward the end of the perfusion even when the concn. of the creatine in the perfused liquid was rather high. The liver cells became exhausted by the artificial conditions to which they were subjected. JOSEPH S. HEPBURN

Action of the extract of spleen. A. FORTUNATO. *Gazz. intern. med. chir.* ig. 26, 13-8(1920); *Physiol. Abstracts* 5, 278-9(1920).—The ext. of normal spleen stimulated phagocytosis, and had little influence on the cytolysis of erythrocytes. When tolylene-diamine was administered to animals, the exts. prep'd. from their spleens inhibited phagocytosis and were powerfully hemolytic. In hemolytic jaundice, the primary effect is upon the erythrocytes, while the toxin accumulates in the spleen. J. S. H.

Aniline poisoning in the rubber industry. PAUL A. DAVIS. *J. Ind. Hyg.* 3, 57-61(1921).—Aniline and its immediate homologs are poisons which act upon the blood and nervous system and produce their effects by internal suffocation. They give rise to hemolysis, destruction of the erythrocytes, and marked production of methemoglobin, and, in severe cases, acidosis. A slight basophilic degeneration of the erythrocytes occurs in acute cases. The leucocytes are but little affected; the only change is a transitory leucocytosis at the beginning of acute cases. Very few complications occur except in severe cases. Alc. apparently is a predisposing factor for early symptoms. Prophylaxis is preferable to after treatment; very good results are obtained by providing the workmen with a lemonade containing Epsom salts to increase catharsis and diuresis. No definite rule for urinary findings could be deduced from the examin. of over 100 urines from patients, ranging from those with marked incipient symptoms to those with persistent symptoms of poisoning. In the most severe cases, traces of hematin, presumably due to destruction of erythrocytes, were found when a large sample of urine was used. In all samples examd., the sp. gr. ranged from 1.005 to 1.030; the reaction

was usually acid; uric acid was present in large amounts; albumin was absent except when severe anemia had been produced; sugar, $C_6H_5NH_2$ and its radical, phenol, and acetone were absent; diacetic acid was absent except in severe cases; traces of hematin were usually detected in 24-hr. specimens after conen. The microscopic examn. showed the presence of large amounts of uric acid crystals, urates, and oxalates. J. S. H.

Influence of subcutaneously administered magnesium sulfate upon the calcium and magnesium balance of sucklings. E. SCHIFF. *Jahrb. Kinderheilk.* 91, 128-33 (1920); *Physiol. Abstracts* 5, 486 (1921); cf. *C. A.* 15, 2474.—Since the Ca content of the urine is increased by subcutaneous administration of $MgSO_4$ to sucklings, possibly the narcotic action of that compd. may be due to replacement of Ca in the tissue by Mg; this suggestion is supported by the fact that many proteins have a great affinity for Mg.

JOSEPH S. HEPBURN

Drugs as a causative factor in neurolabyrinthitis. WILLIAM G. SHEMELEY, JR. *J. Ophthalmology, Oatology, Laryngology* 25, 52-65 (1921).—Three cases of neurolabyrinthitis are described, one due to the action of cinchona sulfate, one produced by intravenous administration of neosalvarsan, and one caused by the combined action of aspirin and As. "Deafness of sudden onset, more or less complete, accompanied by severe tinnitus and vertigo, occurring during the use of quinine, As, Hg, aspirin, Pb, or the salicylates, should serve to put us on our guard, and above all should cause the use of the offending drug to be discontinued." JOSEPH S. HEPBURN

Thromboplastic action of chloroform upon the plasma of birds and of mammals. P. NOLE. *Réunion soc. belge biol.* 1920, 95-6; *Physiol. Abstracts* 5, 406-7 (1920).—Oxalated rabbit plasma, which has been coagulated by means of $CHCl_3$, yields a serum which coagulates 1000 times its vol. of an oxalated soln. of fibrinogen. Apparently the $CHCl_3$ causes a formation of thrombin and not a neutralization of antithrombin. After this treatment with $CHCl_3$, oxalated avian or mammalian plasma contains only a trace of antithrombin. However, if the plasma be first subjected to a treatment which removes a portion or all of the precursors of thrombin but has no action on antithrombin, subsequent treatment with $CHCl_3$ incompletely removes the antithrombin. These results indicate that Ca salts are not a prerequisite for the coagulation of fibrinogen by thrombin, or for the formation of that enzyme at least under certain exptl. conditions. See also *C. A.* 15, 2504. JOSEPH S. HEPBURN

Physiological action of acids, and their solubility in the lipoids. M. PHILIPPSON AND MME. G. HANNEVART. *Réunion soc. belge biol.* 1920, 1570-2; *Physiol. Abstracts* 6, 22 (1921).—Artificial circulation of 0.01 N solns. of "strong" inorg. acids in Locke soln. did not cause fatigue of the striated muscle of the frog. Org. acids in the same concn. produced muscular exhaustion. Each acid in the following list caused exhaustion more speedily than did those preceding it: $HCOOH$, glyceric, lactic, $AcOH$, tartaric, propionic, malic, butyric. When collodion sacs were impregnated with the ether ext. of muscle, these membranes then were very slightly permeable to inorg. acids, and very permeable to org. acids in the following increasing order: $HCOOH$, lactic, $AcOH$, butyric. JOSEPH S. HEPBURN

Recent advances in science—Medicine. R. M. WILSON. *Science Progress* 16, 40-4 (1921).—A discussion of the future of the X-ray and of Ra as therapeutic agents. JOSEPH S. HEPBURN

Action of yerba maté on the normal gastric secretion, and on the gastric secretion in diseases of the stomach. U. C. BONORINO, J. E. CARULLA AND G. P. GOÑALONS. *Soc. biol. Buenos Aires* 1920; *Physiol. Abstracts* 5, 302 (1920).—The same subjects were used in 2 series of expts. In the first series, they were given the usual Ewald-Boas test meal; in the second series, they were given this test meal modified by the substitution

of yerba maté for the tea. On comparison of the gastric secretion in the 2 series, it was found that yerba maté markedly stimulated the secretion of HCl. J. S. H.

Action of extract of hypophysis upon diuresis in the dog and the rabbit. B. A. HOUSSET, J. C. GALAN AND J. NEGRETE. *Soc. Biol. Buenos Aires* 32, 38 (1920); *Physiol. Abstracts* 5, 480 (1921).—In dogs, whether normal or undergoing diuresis, intravenous injection of ext. of hypophysis produced increased diuresis. The vol. of urine excreted in 24 hrs. increased or decreased according to the vol. of water ingested; if the latter vol. remained const., no change occurred in the vol. per 24 hrs. However, the ext. decreased diuresis due to ingestion of water, apparently by impeding absorption of the water. In the rabbit, normal or undergoing diuresis, with normal or enervated kidneys, the ext. of hypophysis always produced a marked decrease in the vol. of urine excreted, accompanied by anorexia. If a const. vol. of water was given, the diuresis in 24 hrs. did not vary.

JOSEPH S. HEPBURN

Comparative study of the trypanocidal activity of arsphenamine and neoarsphenamine. JAY F. SCHAMBERG, JOHN A. KOLMER AND GEORGE W. RAIZISS. *Am. J. Med. Sci.* 160, 25-36 (1920); cf. following abstract.—The object of this study was to det. the comparative therapeutic activity of arsphenamine and neoarsphenamine, also to det. whether different lots of the drugs "showed variation in their trypanocidal activity, in the same manner that their toxicity is likely to vary." Tests were made upon rats weighing 100 to 150 g., pregnant animals being excluded. The animals were infected with *T. equiperdum*, usually 24 hrs. before administering the medicinal, 250,000 to 500,000 trypanosomes per rat being used according to the wt. of the rat. Each animal was weighed after 18 hrs. fasting and injected, by a syringe in a saphenous vein, with a dose of arsphenamine ranging from 0.005 to 0.03 g. per kg. or with neoarsphenamine 0.01 to 0.04. The blood of each animal including the controls was examd. each day over a period of 3 weeks by placing a drop of blood from the tail on a cover glass and allowing the blood to spread in a film when placed on a slide; the results being recorded as few, ++, +++, or +++, the latter indicating too many to be counted. The results are assembled in 9 tables. Conclusions: "Trypanocidal tests employing rats infected with *T. equiperdum* provide a means for detg. the curative properties of arsphenamine and neoarsphenamine. These medicinals proving trypanocidal *in vivo* are probably curative in syphilis; compds., as the mercurials, which are unable to influence exptl. trypanosomiasis, may still influence infections with *T. pallido*; trypanocidal tests possess, therefore, a greater positive than negative value in chemotherapeutic studies in syphilis. In conducting trypanocidal tests the virulence of the strain, the method of infection, the interval between infection and treatment and the wt. of the test animals are modifying factors and must be rendered uniform to obtain satisfactory results. With the strain of *T. equiperdum* employed in these expts. the smallest amt. of arsphenamine sterilizing rats infected 24 hrs. previously varied from 0.01 to 0.03 g. per kg. of body wt., the general av. for 21 compds. prep'd. in 6 different labs. being 0.023. The smallest sterilizing doses of neoarsphenamine under identical conditions varied from 0.02 to more than 0.04 g. per kg. of rat, the av. for 22 compds. from 6 labs. was about 0.040 g. per kg. The trypanocidal activity of different lots of arsphenamine and neoarsphenamine prep'd. in the same lab. and in different labs. varied in a manner analogous to variations in lethal toxicity for rats. The trypanocidal activity of arsphenamine is 1.74 times greater than that of neoarsphenamine, in exptl. infections with *S. obermayeri*, hen spirilliosis and rabbit syphilis. Castelli found arsphenamine from 1.5 to 1.78 times more active therapeutically than neoarsphenamine. The trypanocidal dose of arsphenamine was 4.56 times less the highest tolerated dose for the rat. The corresponding figure for neoarsphenamine was 6.35; this shows a greater margin of safety.

L. W. RIGGS

Toxicity and trypanocidal activity of sodium arsphenamine. J. F. SCHAMBERG, J. A. KOLMER AND G. W. RAIZISS. *J. Am. Med. Assoc.* 76, 1823-4 (1921).—Expts. upon rats, carried out according to previous technic (cf. preceding abst.), led to the following conclusions: The highest tolerated dose of Na arsphenamine for white rats by intravenous injection was 212 to 215 mg. per kg. of body wt. The average tolerated dose of arsphenamine was 105 mg., and of neoarsphenamine, 200 mg. per kg. The smallest trypanocidal doses of Na arsphenamine varied from 16 to 24 mg. per kg. of wt.; the smallest trypanocidal dose of arsphenamine was 5 mg., and of neoarsphenamine 9 mg. per kg. The therapeutic dose of Na arsphenamine was from 8 to 13 times less than the highest tolerated dose which expresses the therapeutic index of this compd. The therapeutic dose of arsphenamine was 21 times less, and of neoarsphenamine 22 times less than the tolerated dose. While Na arsphenamine possesses the low toxicity of neoarsphenamine, it is much inferior to both arsphenamine and neoarsphenamine in trypanocidal or curative activity. The true gage of a remedy is expressed by its chemotherapeutic index, *i. e.*, the relation of the curative to the toxic dose. L. W. R.

Action of bile on tetanus toxin. C. NINNI. *Ann. igiene* 31, 121 (1921); *J. Am. Med. Assoc.* 77, 158.—Expts. with bile and tetanus toxin confirm the assumption that tetanus toxin is of a lipoidal nature. Fresh bile neutralizes tetanus toxin, 0.2 cc. being able to neutralize 10 times the minimal lethal dose. L. W. RIGGS

Gold and platinum as capillary poisons. HANS GELPK. *Arch. exp. Path. Pharm.* 89, 280-300 (1921).—Solns. contg. Au and Pt, or both, in various combinations and forms were introduced into the circulation of cats and dogs. The respiratory and circulatory symptoms were noted and checked against the microscopic findings in the tissues when examined post mortem. With av. doses of Au (10-17 mg. of Au per kg.) a marked effect upon the capillaries was observed. Within a few minutes after the injection hyperemia occurred together with hemorrhage into the pulmonary alveoli. Other organs showed congestion of varying degree. With Pt, in somewhat higher dosage, a similar result was obtained. When the metals were introduced into the circulation of frogs the blood flow of the mesenteric capillaries was immediately retarded, with dilatation and a complete stasis. The compds. acted by paralysis of the contractile elements in the capillary walls. G. H. S.

Mode of action of β -imidazolylethylamine on the human organism. P. SCHENK. *Arch. exp. Path. Pharm.* 89, 332-9 (1921).—The subcutaneous injection of histamine in man induces a pronounced vascular dilatation, particularly marked in the head and in the splanchnic region. It acts as an emetic and causes contraction of the bronchial musculature. The stomach shows increased hypertonic tonal contracture. The diastolic blood pressure becomes very low; from 130/72 to 114/41, (in a case of arteriosclerosis from 197/100 to 80/45). The pulse rate is almost doubled. The blood picture is not essentially altered; there is no eosinophilia. Blood sugar is not affected. Some local reaction occurs at the point of injection. The injection of adrenaline neutralizes these effects in large part. The simultaneous injection of 15 mg. of histamine and 1.5 mg. of adrenaline can be safely given. The histamine does not modify the adrenaline hyperglycemia or the glucosuria. Atropine does not modify the histamine reaction; β -hydroxyphenylethylamine is effective. Histamine probably acts through a paralysis of the sympathetic system or by an effect upon the myoneural junction. G. H. S.

Trinitrotoluene poisoning. L. LEWIN. *Arch. exp. Path. Pharm.* 89, 340-59 (1921).—The local and generalized reactions of the body to trinitrotoluene are described. In the animal body the compd. is readily decomposed; it cannot be found in either blood or urine. Hematin formation and decrease in erythrocyte counts are observed. G. H. S.

Pharmacologic action of guanidine. R. KLINGER. *Arch. exp. Path. Pharm.* 90,

129-41(1921).—The pharmacol. action of guanidine and dimethylguanidine was detd. after the intraperitoneal injection of the compds. into normal and parathyroidectomized cats and rats. With the latter animal methylguanidine was also tested. In cats guanidine or methylguanidine intoxication is characterized by nausea, increase in motor and psychic irritability, increased salivary secretion, and dilatation of the pupils. In animals with a post-operative tetany similar symptoms occurred. In parathyroidectomized animals the administration of Ca quickly led to an improved condition; in animals intoxicated with guanidine or dimethylguanidine even large amts of Ca were without effect. In rats the most pronounced symptom of intoxication was bronchospasm. Salivation occurred, as well as a nasal irritation resembling that seen in anaphylactic guinea pigs, together with muscular spasms. Parathyroidectomized rats were rather more sensitive to intoxication than normal rats. The lethal doses were: for cats, about 0.1 g. per kg.; for rats of 100-150 g. from 15-30 mg. G. H. S.

Effect of sectioning the vagus upon sugar elimination by the kidney. FRITZ HILDEBRANDT. *Arch. exptl. Path. Pharm.* 90, 142-8(1921).—The effect of the injection of adrenaline upon the amt. of blood sugar in rabbits was detd. both before and after section of the vagi. In normal animals secretion of the sugar by the kidney takes place when the blood sugar increases to 0.25%; in animals with sectioned vagi this value is reduced to 0.19%. G. H. S.

Muscle tonus. I. Effect of cocaine and novocaine on muscle tonus. Nicotine-cocaine antagonism. E. FRANK AND R. ALEXANDER KATZ. *Arch. exptl. Path. Pharm.* 90, 149-67(1921).—The antagonistic action of nicotine and cocaine was demonstrated by the injection of these compds. into frogs. The rigidity induced by nicotine could be completely and quickly resolved, with a complete loss of tonus, by the injection of cocaine. If the cocaine was first injected and the tonus abolished a subsequent injection of nicotine was without effect. Expts. of this type, and others with decerebrate frogs, show a complete antagonism. Cocaine abolishes the tonic condition; apparently the sarcoplasm is transformed into a more fluid state which no longer is endowed with plastic flexibility. **II. The point of attack of guanidine and methylguanidine in the production of motor irritability. Guanidine-cocaine antagonism.** E. FRANK AND R. STERN. *Ibid* 90, 168-79.—An antagonism between guanidine and cocaine (or novocaine) was demonstrated in the frog. Expts. on the response to elec. stimuli after guanidine intoxication indicate that guanidine acts upon the "receptive substance" of the sarcoplasm and not upon the muscle substance in general. Synthetically prep'd. methylguanidine acts qualitatively exactly as guanidine. G. H. S.

Effect of some drugs upon sensation to pain. WILHELM MÖHRKE. *Arch. exptl. Path. Pharm.* 90, 180-95(1921).—A synergistic effect is exhibited by narcotine and morphine; in a mixt. of the two the effect of morphine is increased by 400 to 700%. Quinine neither increases nor antagonizes the action of morphine. G. H. S.

Physiological and pharmacological experiments on the frog rectum. JOSEF SCHÜLER. *Arch. exptl. Path. Pharm.* 90, 196-241(1921).—Anatomically the frog rectum can be divided into two segments; an interior portion somewhat dilated, and a thinner posterior portion with narrower lumen. This last portion is from 10 to 20 mm. long and in Tyrode soln. shows regular contractile waves which persist for 24 hrs. or longer and are typical of smooth muscle contractions. In response to stimulation the rectum prepn. shows a close parallelism to heart muscle. In its pharmacol. relationships (tested with a great many compds.) it reacts as does the typical intestine prepn. G. H. S.

Fate of salicylic acid and some of its derivatives in the organism. W. DEVRIENT. *Arch. exptl. Path. Pharm.* 90, 242-55(1921).—After oral administration of Na salicylate the urinary elimination of salicylic acid was detd. in healthy individuals of different

ages. The method of Sauerland was used for detn. Apparently the age of the person has no effect upon the elimination (contrary to the view of Brouardel) either as regards the total amt. eliminated or the rapidity of the process. Rarely could salicylic acid be detected in the urine after the first 24 hrs. The largest percent of the amt. given to be recovered in the urine was 14.86, and this value was exceptionally high; usually but from 3 to 6% was recovered. Acetylsalicylic acid was eliminated up to 6.07%; apyron (Mg salt of acetylsalicylic acid) up to 2.79%; the ethyl ester of salicylic acid up to 4.68%. In some instances with these derivs. traces were found on the 2nd and 3rd days. Tissue emulsions and Na salicylate were mixed and allowed to stand at room temp. for 20-115 hrs. The amt. recovered indicated that the compd. was either decompd. or absorbed by the tissue. In another expt. rabbits were injected subcutaneously with Na salicylate and killed after 24 hrs. Detns. made upon the tissues showed 1.97% of the injected material in the collected urine and 0.35% in the liver. The other organs were negative.

G. H. S.

Relation between heart agents and the physiological action of cations. IV. Action of nonelectrolytes. O. LOEWI. *Arch. ges. Physiol.* 187, 105-22(1921).—The frog heart poisoned with oxalate recovers when treated with isotonic nonelectrolyte (mannitol) solns. or with Ca-free NaCl solns. which contain nonelectrolytes. The addition of nonelectrolytes to solns. in which the Ca is entirely lacking or below the optimal concn. increases the heart beat. Nonelectrolyte solns. cause a contraction of the heart. This effect is increased by the addition of a normal Ca content, and further augmented by the addition of KCl. The simple addition of KCl, without previous addition of Ca, leads to relaxation. Narcotics induce the same effects as capillary-inactive nonelectrolytes. The position is taken that nonelectrolytic substances, such as digitalis, render the heart more sensitive to Ca.

G. H. S.

Pharmacology of liquid paraffin. L. ROST. *Med. Klin.* 17, 35-6(1921).—The harmless effects of paraffin oil when administered orally or by injection (guinea pigs, rabbits, dogs, cats) pertain only to the pure preps. Impure preps. are quickly fatal to guinea pigs after intraperitoneal injection, showing pronounced irritation as well as toxic properties. The relation of toxicity to H_2SO_4 content was not established.

G. H. S.

Calcium treatment of purpura hemorrhagica. HUBERT SIEBEN. *Med. Klin.* 17, 105-7(1921).—The results obtained by the injection of Ca in purpura hemorrhagica depend upon the effect of Ca upon the blood coagulation and perhaps also upon its action upon the colloids of the endothelium.

G. H. S.

Parenteral introduction of colloidal iron in anemias. O. WEBER. *Med. Klin.* 17, 253-5(1921).—Successive blood counts made upon cases of severe anemia during the course of intravenous injections of colloidal Fe showed that the compd. exerted a powerful stimulation of the blood-forming tissues. The red cell counts rose from 1.1 to 3 million; hemoglobin from 30 to 85%.

G. H. S.

Poisoning with green mushrooms (*Amanita phalloides*). LUDWIG WELSMANN. *Med. Klin.* 17, 780-2(1921).—A series of 12 cases of acute poisoning due to eating *Amanita* are reported. From a correlation of the amt. eaten with the severity of the intoxication it is concluded that the amt. of poison in the fungi varies from year to year. The poison is not present in the milk of the mother even though the maternal intoxication is fatal.

G. H. S.

Colloidal silver and acute rheumatic conditions. WALTHER BLUMENTHAL. *Med. Klin.* 17, 786(1921).—Colloidal Ag compds. made by other than elec. methods should never be employed in therapy, since they are often highly toxic. The elec. Ag colloids should be administered by intravenous rather than by subcutaneous or intramuscular

injection. The particular field for medication of this nature is in rheumatic conditions in individuals who are refractory to salicylates. G. H. S.

Pharmacological and clinical observations upon the action of crystalline lobeline on the respiratory centers. ALBERT ECKSTEIN, ERICH ROMINGER AND HERMANN WIELAND. *Z. Kinderheilk.* **28**, 218-42(1921).—The alkaloid lobeline is obtained from *Lobelia inflata* as a cryst. base of the formula $C_{20}H_{24}O_2N$, m. 128°. The pharmacol. action of this cryst. compd., in the form of a hydrochloride, was compared with that of the amorphous prepn. Animal expts. and clinical tests showed it to have a sp. stimulating effect upon the respiratory center. G. H. S.

Notes on the system picric acid + sodium thiosulfate, and its use in antiblennorrhagic therapeutics. FÉLIX MARTIN. *J. pharm. chim.* **23**, 452-6(1921).—The treatment aims at the formation of about 3 cc. of gaseous SO_2 in the urethra by the injection of 5 cc. of an equimol. mixt. (0.02 N) of the 2 substances in soln., (the mol. ratio of decompr. is 2:1). However, the method fails to give the desired result, because at a temp. of 37° and a concn. of 0.02 N, the above equimol. system attains in 25 to 30 min. a state of equil. in which the liberated SO_2 corresponds to the decompr. of only 14% of the $Na_2S_2O_3$ employed. Hence 5 cc. of the mixt. will liberate less than 0.5 cc. SO_2 , which remains in soln. The greater part of the picric acid remains in a free state, a concn. of 0.004 being injected. S. WALDBOTT

Chemotherapeutic studies with ethylhydrocupreine hydrochloride in experimental pneumococcus pleuritis. JOHN A. KOLMER AND JOSEPH R. SANDS. Univ. Penn. *J. Exptl. Med.* **33**, 693-711(1921).—Solns. of ethylhydrocupreine-HCl (A) show a pronounced bactericidal activity for pneumococci in pleural pus. The highest tolerated dose of A for guinea pigs by intrapleural injection is about 0.2 to 0.3 cc. of a 1:100 soln. per 100 g. wt., corresponding to 2-3 cc. of soln. or 0.02-0.03 g. of drug per kg. body wt. The injection of 1 cc. of a 1:500 soln. of A into each pleural cavity of a guinea pig weighing 350-500 g. produces no evidences of toxicity or irritation of the pleura. The injection of 1 cc. of a 24-hr. dextrose blood broth culture of virulent Type I pneumococci into the right pleural cavity of guinea pigs produces acute suppurative pleuritis on both sides associated with suppurative pericarditis, which generally terminates fatally within 72 hrs. with pneumococcus bacteremia. The injection of 1 cc. of 1:500 soln. of A into each pleural cavity at varying intervals up to 24 hrs. after pleural infection has usually shown a marked curative influence. The intrapleural injection of ethylhydrocupreine, Na oleate and boric acid has also shown a decided curative effect in acute suppurative pneumococcus pleuritis of guinea pigs. C. J. WEST

Toxicity of some thioureas and thiuramdisulfides. P. J. HANZLIK AND A. IRVINE. Western Reserve Univ. *J. Pharmacol.* **17**, 349-55(1921).—Administered intragastrically to rabbits, $CS(NHPh)_2$ was found to be physiol. active and toxic, the minimal fatal dose being 1.5 g. per kg. $CS(NHC_6H_4Me-o)_2$ was found to be about half as toxic. Cats appeared to be more susceptible to these compd. than rabbits. These agents cause early depression; later the excitability of higher functions is increased leading to convulsions, coma and death. $(Me_2NCS)_2S_2$ was found to be about 10 times as toxic for rabbits as $(Et_2NCS)_2S_2$, for which the minimal fatal dose was found to be about 3 g. per kg. C. J. WEST

Quantitative studies in chemotherapy. V. Intravenous versus intramuscular administration of arsphenamine. Curative power and minimum effective dose. CARL VORECKLIN AND HOMER W. SMITH. Hyg. Lab. *J. Pharmacol.* **17**, 357-75(1921); cf. *C. A.* **15**, 123, 1945.—The intramuscular administration of arsphenamine and neo-arsphenamine is just as efficacious as the intravenous administration of these drugs in the treatment of exptl. trypanosomiasis, as judged by the minimum effective dose and the % of survivals of treated animals. The significance of this point in the treatment

of human syphilis is discussed. The ratio of the minimum lethal dose to the minimum effective dose is a substantial index to the curative power of a given drug under exptl. conditions.

C. J. WEST

Action of drugs in infection. I. Influence of morphine in experimental septicemia. ADOLPH KRAFT AND NEIL M. LERCH. Univ. of Ill. *J. Pharmacol.* 17, 377-84(1921).—Morphine sulfate in doses of 0.03 g. (0.5 grain) which is about $\frac{1}{4}$ to 0.1 fatal dose lowers the resistance of rabbits towards septicemia by the *Streptococcus hemolyticus*. It also lowers the temp. of rabbits. In the administration of morphine at least 2 effects should be considered: the sedative action and its influence on the course of infection. The harmful influence is probably due to a number of factors, such as inhibition of phagocytosis, increase in intestinal stasis, with the increased production of toxins, and a general depression of the body temp., of metabolism and the body defense.

C. J. WEST

Salicylates. XIII. Liberation of free salicylic acid from salicylates in the circulation. P. J. HANZLIK. Western Reserve Univ. *J. Pharmacol.* 17, 385-93(1921); cf. *C. A.* 14, 1159.—Free $\text{HOCH}_2\text{CO}_2\text{H}$ is demonstrably liberated from the Na salt at a very low degree of acidity (H-ion concn. of p_{H} 6.7), more definitely at p_{H} 6.5. The presence of 25% serum or plasma in salicylate "buffer" mixts. prevents the liberation of free $\text{HOCH}_2\text{CO}_2\text{H}$ at the high degree of acidity of p_{H} 5.9. Therefore it is improbable that the free acid could be demonstrated in the circulation during life. This was fully confirmed on animals subjected to fatal asphyxia and whose cardiac and arterial bloods were rendered very slightly acid (p_{H} 6.8 or 6.9). Consequently the theory that free $\text{HOCH}_2\text{CO}_2\text{H}$, liberated by virtue of the greater CO_2 content of venous blood of the right heart, exerts an antiseptic action and prevents the development of a right-sided auriculo-ventricular (tricuspid) endocarditis in rheumatic fever is untenable. C. J. W.

Effect of benzyl benzoate on the leucocytes of the rabbit. LUDWIG A. EMGE AND JENS P. JENSEN. Stanford Univ. School Med. *J. Pharmacol.* 17, 415-29(1921).—In rabbits a continuous administration of BzOCH_2Ph in small doses leads to a leucocytosis which in somewhat larger doses is accompanied by an increase in small mononuclear cells. This leucocytosis is transient and ultimately ends in a late mild leucopenia. In large single doses there is a tendency to change the even rise of the leucocytes into a broken curve of a diphasic character with a distinct depression of the polymorphonuclear element. In the presence of latent or quiescent infections in rabbits larger doses produce an acute return of the disease. BzOCH_2Ph has no or only a very slight depressing influence on the red blood cells and the hemoglobin.

C. J. WEST

Isopropyl alcohol (LÖFFL) 17.

DIXON, W. E.: *Practical Pharmacology*. New York: Macmillan Co. 88 pp. \$2.50.

I—ZOOLOGY

R. A. GORTNER

Does the administration of the anterior lobe of the hypophysis to the tadpole produce an effect similar to that obtained from thyroid feeding? PHILIP E. SMITH AND GARNETT CHENRY. *Endocrinology* 5, 448-60(1921).—In a series of carefully controlled expts. it is demonstrated that fresh and dried anterior lobe substance of the hypophysis does not decisively alter the development of the normal tadpole or induce metamorphosis in the thyroidless specimen. Analysis of a prepn. of anterior lobe substance which had been found to possess a metamorphic stimulating effect revealed the presence of 0.1787 mg. of I_1 per g. of substance. The dried anterior lobe prepn. made by the authors contained but 0.0037 g. I_1 . When an amt. of KI sufficient to raise the I_1 content of the local prepn. to that of the purchased prepn. was added and the mixt. fed to normal and thyroidectomized tadpoles their development was about the same as the controls receiving

the fresh anterior lobe substance. When the I₂ content of the local prepn. was raised to that of the purchased lot by thyroxin, however, the feeding of this mixt. to normal and thyroidless tadpoles resulted in an acceleration of growth and metamorphosis in both groups of animals comparable to that obtaining from the com. prepn. These results speak against any vicarious functioning of the hypophysis for the thyroid.

F. S. HAMMETT

The substances needed for the growth of a pure culture of *Colpidium colpoda*. R. A. PETERS. Cambridge. *J. Physiol.* 55, 1-32(1921).—Pure cultures of the protozoan *Colpidium colpoda* were grown in synthetic media and apparently kept free from bacteria and other organisms for over a year. It seems that these protozoa must be able to absorb their food in a sol. form from the surrounding medium. N can be supplied entirely from NH₄ salts or from amino acids. C can be supplied by glyceric, propionic, pyruvic or tartaric acids, but not by acetic, succinic, citric or lactic acids. When the cultures were made in glass test-tubes, NH₄ salts (or amino acids), P and Cl could not be omitted from the media. Omission of K or of Mg in glass cultures was without effect, but in quartz test-tubes K deficiency led to a failure of movement and death. Mg deficiency also inhibited growth. No effect was produced by omitting the Na, Ca, or S separately from the medium, though it is not claimed that traces of Na, Ca or S were not still present. U salts cannot be substituted for K salts in the growth process, although under some conditions the addition of U may accelerate growth. J. F. L.

The physiological changes produced by radium rays and ultra-violet light in the eggs of *Nereis*. A. C. REDFIELD AND ELIZABETH M. BRIGHT. Harvard Med. School and Univ. Toronto. *J. Physiol.* 55, 61-85(1921).—When the eggs of *Nereis* are exposed to radiations and subsequently fertilized the effects of α -rays and ultra-violet light resemble β - and γ -rays in altering the process of membrane formation and jelly secretion except that the changes produced are limited by the first pair of rays to one side of the egg. Wave lengths between 7000 and 3000 Å. U. are ineffective. "The differences in the effects of the α -, β -, and γ -rays and ultra-violet light on membrane formation, on the induction of artificial parthenogenesis, and on the prevention of development are due to differences in the penetrating power of these radiations, and the failure of visible light to affect the egg is attributable to the limited absorption of those wave lengths by protoplasm. Since the change produced in the egg is simple in nature it is justifiable to suspect that some common mechanism underlies the effects produced by these different radiations."

J. F. LYMAN

Action of vapors of chloropicrin on *Argas reflexus* Fabr. P. REMY. *Compt. rend.* 172, 1619-21(1921).—This parasite, commonly known as the dove tick, is a serious pest because of the destruction it causes among pigeons, and discomfort to human beings. Its extermination is extremely difficult as it can live for months and perhaps years without food, and its habits of concealment are such as to make ordinary insecticides ineffective. The application of chloropicrin according to the technic of G. Bertrand proved successful in eradicating the pest. A concn. of 20 to 30 g. per cu. m. was found most convenient, care being taken that the space treated is tightly sealed during the process. To render surfaces impermeable it may be necessary to coat them with linseed oil or paraffin. Masks should be worn while handling the gas. The eggs hatch in 8 to 15 days requiring a second application of chloropicrin about one month after the first.

L. W. RIGGS

Effect of human thyroid upon tadpoles. C. WEGELIN AND J. ABELIN. *Arch. expil. Path. Pharm.* 89, 219-51(1921).—Human thyroid tissue from diverse sources was fed to tadpoles and the effects upon the growth processes were noted. Feeding the control series with normal thyroid tissue gave the typical reaction. Thyroid tissue from new-born infants was almost always without effect, particularly if the glands

were deficient in colloid and I. It appeared that the presence of even a minute amt. of I was adequate to cause a positive result in the feeding expts. With tissue from cases of parenchymatous and colloid goiter the results were sometimes positive, sometimes negative; the effect being in no way correlated with the amt. of colloid material present. Thyroid tissue from cases of adenomata reacted like normal tissue, even though the tissue was definitely adenomatous. The thyroid from a case of Basedow's disease was fully active.

G. H. S.

12—FOODS

W. D. BIGELOW AND A. E. STEVENSON

Opinions on food control. II. A. BEHR. *Chem.-Ztg.* 45, 637-8(1921).—Further discussion Cf. *C. A.* 15, 275.

H. A. LEPPER

Present status of nutrition and its relation to food manufacture. VICTOR K. LAMER. *Columbia University. Am. Food. J.* 16, No. 7, 7-10(1921).—A review of the scientific knowledge now available on nutrition values. H. A. LEPPER

The scientific principles of cold storage. WALTER STILES. *J. Soc. Chem. Ind.* 40, 112-5T(1921).—A discussion of the preservation of food by cold storage above and below the f. p. and the problems involved in improving storage conditions. Fish and small pieces of beef were found to thaw without sepn. of liquid when frozen quickly to -21° suspended in brine. H. A. LEPPER

Notes on the analysis of milk. CH. PORCHER. *Ecole Vétérinaire de Lyon. Ann. fols.* 13, 35-7(1920).—The addition of 1 drop of 40% formaldehyde (contg. about 0.015 g. CH_2O) per 50 cc. of milk does not affect the reducing power of the milk, owing to its combination with NH_2 groups of the milk ($-\text{NH}_2 + \text{OCH}_2 = -\text{N}=\text{CH}_2 + \text{H}_2\text{O}$), but a greater amt. increases the reducing power of the milk. One drop per 50 cc. suffices amply to preserve the milk for 8 days and more, if added shortly after milking. The rate of delivery of the milk from the pipet has a considerable effect on the wt. delivered, especially in the case of rich milks. A. P.-C.

Indirect analysis and watering of milk. A. BOURIEZ. Lille. *Ann. fols.* 13, 606-18(1920).—The indirect analysis of milk can be extended to the calcn. of casein, dissolved solids, and d. of serum and of fat-free milk. The only detsn. required are the d. and fat content of the milk. B. derives the following formulas, in which B is the butter-fat, D the d., and results are expressed in g. per 1. Total solids, $E = 1.17B + \frac{8}{3}$ (1000($D-1$))). Water, $A_4 = 1000 - \frac{5}{3}(1000(D-1) + 1.17B)$. Solids not fat, $\frac{8}{3}(1000 - (D-1) + (B/0.94) - B)$. Casein, $C = 0.3(E-B)$. Dissolved solids, $S = 0.7(E-B)$.

Serum d., $1000(D'-1) = \frac{[2.5(1000D-E)/(E-B)]+1}{750}$. D. of the fat-free milk, $\frac{375}{[(1000D-E)/(E-B)]+0.625}$

1000(D'_1-1) = $\frac{375}{[(1000D-E)/(E-B)]+0.625}$ (Lindet's formula). The usual methods of detecting watering are based on one or more of the following: (1) constancy of the solids-not-fat, (2) constancy of the dissolved solids, (3) d. of the serum; to these may be added (4) constancy of the ratio of water to solids-not-fat in unwatered milk, and (5) the d. of the fat-free milk. It is shown that. (1) If $(1000D-E)/(E-B)$ is equal to or less than 10, the milk is not watered, while if it is greater than 10 the milk is watered. (2) In unwatered milk the wt. of solids-not-fat is equal to at least 0.1 that of the water, while in a watered milk the difference between the wt. of water and 10 times the wt. of solids-not-fat gives a measure of the minimum amt. of watering. (3) In unwatered milk the d. of the fat-free milk (calcd. by means of Lindet's formula) never falls below

1.0353. The above calcs. are strictly applicable only to normal milks. In certain regions the milk from Dutch cattle gives a ratio of water to solids-not-fat slightly higher than 10, which would tend to show a slight watering. In certain cases it may therefore be advisable to make an allowance which need not be much above 5-6%. A table is given showing the effects of various degrees of watering on a milk in which water/solids-not-fat = 10, d. of serum = 1.0288, and d. of fat-free milk = 1.0353. A. P.-C.

A comparison of fat test in milk as determined by a cow-testing association and by a creamery. H. C. TROY. Cornell Agr. Expt. Sta., *Bull.* 400, 65 pp. (1920).—The av. fat % in milk secreted at 2 successive milkings of a herd, as found by the association tester, commonly ranged from 0.2 to 3% above or below the fat % for the month as found by the creamery. In herd milk differences between the association test and the creamery test of more than 5% of fat for monthly periods were not unusual. The differences between the fat % found by the 2 tests were less than 0.1% in 59.375% of the 32 complete annual records, were between 0.1 and 0.2% in 31.25% of the records and were greater than 0.2% in 9.375% of the records. The 2 tests agree fairly well in recording fat % changes due to an advance in the period of lactation where the records covered a production period of several months. J. J. SKINNER

Höyberg's method for the determination of fat in milk. ORLA-JENSEN AND B. RASMUSSEN. *Mælk. Tid.* 14, 188-92 (1921).—A comparison of the Höyberg, Gerber and Rosc-Gottlieb methods for the detn. of fat in milk. Concordance of results are good. Results by H.'s method are a trifle higher in general. G. E. HOLM

A new apparatus for the determination of the catalase content of milk. A. MACHENS AND FR. CORDES. *Milchwirtschaft Zentr.* 3, 25-7 (1921).—Two small bottles (a and b) are connected by a glass tube contg. a 3-way stopcock. To b is attached a graduated buret. In a is placed milk and H_2O_2 and in b water enough to make 0.00 reading on the buret. The pressures are adjusted by means of the stopcock and connection is then made between the two chambers. The O_2 liberated in (a) forces the water up into the buret of b and the vol. is read. G. E. HOLM

Volumetric determination of chlorine and lactose in milk. HANS WEISS. *Mitt. Lebensm. Hyg.* 12, 133-43 (1921).—Cl as detd. in the ash varies according to the method of ashing, owing to volatility of chlorides. Normal milk is more easily and rapidly ashed than pathological milk. Cl can be titrated accurately in the fat- and protein-free soln. of milk as follows: Add 10 cc. of 20% $Al_2(SO_4)_3$ to 20 cc. of diluted milk in a 200-cc. vol. flask; add about 8 cc. 2 N NaOH (NaOH used to neutralize $Al_2(SO_4)_3$ detd. by blank titration with azolitmus paper). Dil. to mark, filter and titrate the Cl in 100 cc. of clear filtrate with $N/35.5$ $AgNO_3$, with 1 cc. of 10% K_2CrO_4 soln. Lactose can be detd. by the method of Bruhns (*C. A.* 15, 351) wherein boiling for 6 min. and dilg. with 30 cc. H_2O are recommended in place of 2 min. and 50 cc. H_2O . A table is given for computation of results. Analyses of 50 samples of normal and pathol. milk gave results for the "chlorine sugar" no. which were above the max. 1.5 of Koestler (*C. A.* 15, 1581). The minimum value found by W. was 2.00 and the max. 10.12, the latter on a milk from a cow with mastitis. A mixed milk having a value of over 2.7 is to be strongly suspected of contg. a pathologically secreted milk. For routine analysis the Cl value alone is believed to indicate abnormal milk. Only if the Cl is above 1.5 g. per l. by the above method is it necessary to det. lactose for verification. The mol. concn. const. was calcd. according to Mathieu and Ferré (*C. A.* 8, 2908) on the above 50 samples and gave values of 66.6-77.4 on normal milk. H. A. LEPPER

Detection of the skimming of milk. CH. PORCHER. Ecole Vétérinaire, Lyon. *Ann. fals.* 13, 531-9 (1920).—A discussion of the papers of Vandam (*C. A.* 8, 3602) and Ledent (*C. A.* 14, 578) showing that the Vandam ratio and the Ledent ratio are practically useless for the detection of skimming. The fat content of milk (and especially

of individual milks) varies within such wide limits, while all the other constituents are much more const., that it is practically impossible to detect skimming, especially in individual milks. Various other ratios, which have been put forth in English-speaking countries (lactose/protein, protein/fat), but which do not appear to have been considered to any great extent in France, are not much more satisfactory than the Ledent and the Vandam ratios.

A. P.-C.

Milk serum. R. LEDENT. Liège. *Ann. fals.* 13, 601-5(1920).—L. previously showed that for pure milks the d. of the serum varied between 1.027 and 1.029, and that small additions of water appreciably lowered the d. (C. A. 14, 783). Further results are given, which confirm those previously obtained. An addition of 10% of H_2O can be detected with certainty, except in the case of milks which before watering would give a serum d. of 1.029, in which case the d. falls to about 1.0265. The d. of serum of milk from cows afflicted with aphthous stomatitis is lower than that from healthy cows, though at times there is but little difference. It is suggested that the d. of the serum be used for detecting whether the milk comes from cows afflicted with this disease, as well as for detecting watering.

A. P.-C.

The albuminoids of milk. L. LINDET. *Le lait* 1, 161-170(1921).—L. seeks to justify Beau's classification of the milk proteins which necessitates the introduction of the term "lactéine" for the total proteinogenous matter of fresh milk (cf. C. A. 15, 3154). He therefore reviews the porcelain filtration expts. which led Lindet and Ammann (*Ann. inst. agron.* 1906, 291) and Lindet (*Ann. inst. agron.* 1913, 273) to adopt the terminology of *alpha* casein and *beta* casein (the former for ordinary casein and the latter for lactalbumin and lacta-globulin). From this review L. maintains that the colloidal nature of milk demands the recognition of the 2 individuals *alpha* casein and *beta* casein. The electrochem. behavior of *alpha* casein and *beta* casein is almost entirely avoided in this article; likewise the results of acid hydrolysis of the 2 individual proteins are not alluded to, and it is chiefly upon these two factors that the American classification of the milk proteins depends. Contemporaneous investigations of the milk proteins and their classifications are practically ignored.

H. F. ZOLLER

Presence of pentoses in milk. O. LAXA. Prague. *Le lait* 1, 118-21(1921).—Investigators have frequently pointed out that the polarimetric detns. of lactose in milk yield values somewhat higher than reduction methods. This has been assumed to be caused by the presence of some substance in milk possessing a rotatory power greater than lactose. Sebelin believed a pentose similar to arabinose to exist in milk. By detg. the furfural obtained from 100 cc. of milk he concluded that there must be 50-70 mg. of a pentose like arabinose present. The substance yielding furfural was not pptd. by $CuSO_4$. S. contends that cows can obtain pentoses in their nourishment at certain times of the year and these yield pentoses to the milk. L. examt. milk known to contain filth and found high phloroglucide yield from the same. Examt. of the slime accumulating upon the bowl of cream separators showed a fairly high phloroglucide content; but not sufficiently high to conclude that the pentoses (or phloroglucide-forming compds.) come entirely from outside contamination, or as "impurities." Since the sirup in lactose factories which contained 15 % of lactose furnished 107 mg. of phloroglucide per 100 cc. or 61 mg. as coming from pentoses in this quantity of sirup, it is not in sufficient quantity for extrn. and identification.

H. F. ZOLLER

The distribution of saline substances and mineral elements in milk. CH. PORCHER AND A. CHEVALLIER. *Compt. rend.* 172, 1605-7(1921).—Analysis of the ash does not show how the mineral substances exist in the milk because of changes in the org. complexes during the ashing. An artificial milk was prep'd. in which all chem. and physico-chem. relations of the components corresponded to those of an av. milk. Gelatin or beef albumin freed from globulin was used in place of albumin of milk. The

mineral compn. used was NaCl, 1.09; KCl, 0.92; tri-Ca citrate, 1.78; tri-Mg citrate, 0.78; tri-K citrate, 0.67; NaHCO₃, 0.25; KH₂PO₄, 1.00; K₂HPO₄, 1.10; CaHPO₄, 1.06; MgHPO₄, 0.16; K₂SO₄, 0.18; and CaO (from casein), 0.61 g. per l. H. A. LEPPER

Decomposition of hydrogen peroxide by pasteurized milk. MARC FOUASSIER. *Le lait* 1, 171-6(1921); cf. *C. A.* 14, 3261.—Sarthou believed that the substances present in pasteurized milk which caused decompn. of H₂O₂ are due to lactic acid bacteria. F. studied the decompn. of H₂O₂ in sterile lactose-peptone media which had been inoculated with pure cultures of *B. subtilis*, *Tyrothrix*, *Oidium*, lactic acid bacteria and a culture of lactose yeast. He detd. the catalase content (cc. of O evolved in 30 min.) and the presence of H₂O₂ after a certain period following the addition. The *B. subtilis* and *Tyrothrix* cultures showed the max. of catalase content, *Oidium* some and the yeast a trace, while the lactic acid culture showed no catalase. Evidently the enzyme which causes decompn. of the peroxide is produced by *B. subtilis* and *Tyrothrix* in large quantity while with the lactic acid bacteria it is practically nil. The presence of undecompr. peroxide was found in case of the lactic acid organisms without fail, while it was absent in case of the *B. subtilis* and *Tyrothrix*. The introduction of these bacteria in sterile milk yielded similar results with peroxide. The development of the catalase was not coincident with the development of acidity, except in case of the dual mixts. of *B. subtilis* and *B. acidi lactic*. There was no relation between the acidity of the cultures in milk and the production of O from the peroxide. It is interesting to note the associative effect upon acid production by the lactic acid organism of the co-culturing with *B. subtilis* and *Tyrothrix*. F. concludes that addition of H₂O₂ to milk for sterilizing purposes is in keeping with the findings of those who strenuously advocate its use in the preservation of milk for food purposes and the great rate of its disappearance from milk, either raw or pasteurized, is conditioned by the presence of peptonizers which largely resist pasteurization and whose spores frequently withstand boiling temps. H₂O₂ can safely be added to pasteurized milk to increase its period of antisepsis. H. F. ZOLLER

Detection of goat milk in mixtures with cow milk. WALTER AUSTEN. *Milchwirtschaft Zentr.* 10, 125-7(1921).—Twenty cc. of skimmed milk, placed in a Gerber fat detn. tube, +2 cc. of 25% NH₄ are mixed and placed in a water bath at 50-60° for ½ hr. The tube is centrifuged at 1200 r. p. m. Cow milk gives little or no ppt. Above 20% goat milk gives a marked ppt. Under 20% of goat milk results are more or less uncertain. G. E. HOLM

The constancy of the lactose content of cow milk. CH. PORCHER. Ecole Vétérinaire de Lyon. *Ann. fols.* 14, 18-22(1921); see also next abstract.—P. challenges Monvoisin's statement (*Le lait: Physiologie, Analyse, Utilisation*. 1920, p. 114) to the effect that variations as great as nearly 33% occur in the lactose of cow milk.

A. P.-C.

The constancy of the lactose content of cow milk. A. MONVOISIN. *Ann. fols.* 14, 96-100(1921).—Reply to Porcher. (See preceding abstract.) A. P.-C.

Note on the constancy of the solids-not-fat of the milk of an individual cow during several consecutive months. CH. PORCHER. Ecole Vétérinaire de Lyon. *Ann. fols.* 13, 78-84(1920).—P. carried out expts. from Dec. 21, 1917 to Apr. 5, 1918 with a cow which was constantly under his personal and immediate observation. His analyses show that there is a decided parallelism between the total solids and fat content of the milk; that the fat content varies within very wide limits (less than 2% to nearly 10%), the evening milk being usually richer in fat than the morning milk, but not always; and that the corrected solids-not-fat (*i. e.*, the solids not fat in the fat-free milk) is nearly always a little higher in the evening milk. The variations are from about 101 to 105 g. per l., so that the max. variation is about 4%. This variation is attributed to milk retention owing to the longer period between the evening and morning milkings than

between the morning and evening milkings. (Cf. *C. A.* 14, 1585.) Numerous analyses are tabulated and plotted.

A. P.-C.

The "simplified molecular constant" of milks of the Finistère. A. AUGUET. Municipal Lab., Brest. *Ann. fals.* 14, 204-25 (1921); cf. *C. A.* 8, 2908-9.—Tables are given covering the analyses of nearly 400 samples of milk (all from the Finistère). From the discussion of the results the following conclusions are drawn: By means of Mathieu and Ferré's simplified mol. const. (S. M. C.) addition of 5% of water can be detected with certainty, which could not be done merely by the detn. of solids other than fat. This is practically the limit of the cryoscopic method, which is more difficult to carry out and does not lend itself so readily to being used for a series of analyses. In the case of the Finistère milks, the S. M. C. is particularly useful for the detection of watering of skimmed milks, and it can nearly always differentiate between watered milk and genuine but poor milk. It is not advisable to use the S. M. C. with milks which contain a high percentage of lactic acid and which are partially coagulated. In spite of its numerous merits, the S. M. C. cannot always replace alone the detn. of solids other than fat, and both should be detd. so as to obtain confirmatory evidence. A. P.-C.

Boemer's method for the detection of tallow in lard. VITOUX AND C. F. MUTTELET. *Ann. fals.* 13, 593-601 (1920).—Boemer's method (*C. A.* 8, 1174) is based on the presence in lard of α -palmitodistearin, m. 68.5°, and in tallow of β -palmitodistearin, m. 63.3°. The compn. of the fatty acids from both isomers is identical, and the m. p. is 63.2°. Hence, the difference between the m. p. of the glyceride and of the fatty acids decreases with increase in tallow content. The method employed by V. and M. was as follows: 50 g. of perfectly clear, filtered fat are weighed into a 150-cc. beaker, dissolved in 50 cc. of purified acetone, warmed if necessary, cooled to 15°, filtered if necessary (it is extremely important that there should be no particles in suspension), covered with a watch glass, and allowed to crystallize, crystn. being hastened by frequent stirring. After about 1 hr. the cryst. deposit is filtered by suction through paper on a Buchner funnel, allowed to drain so as to eliminate as much of the mother-liquor as possible, and the remaining solvent removed by placing in a H_2SO_4 desiccator. The crystals are then dissolved in 50 cc. of Et_2O (with the same precautions as before), the soln. is allowed to crystallize as above, and this second crop of crystals is sepd. from the solvent in exactly the same manner. Part of them is used for the m.-p. detn. and part for the prepn. of the free fatty acids. About 0.1-0.15 g. of the finely pulverized crystals is boiled for about 10 min. with 20 cc. of 0.5 N KOH in a 100-cc. sapon. flask, the liquor (about 10 cc.) is dild. with about 4-5 vols. of H_2O , transferred to a sepg. funnel, acidified with 10 cc. of 25% HCl, the free fatty acids are extd. with Et_2O , the ext. is washed twice with dstd. H_2O , filtered into a crystg. dish, and placed in a H_2SO_4 desiccator. To obtain satisfactory results with the m.-p. detns. it is necessary that the glycerides and the fatty acids be treated in exactly the same manner, which is best accomplished by doing them simultaneously. The capillary tube method is used, one being attached to each side of the thermometer and heated in water at the rate of about 1° a min. The m. p. is taken to be that point at which the crystals just become clear and transparent. The mean of 2 closely agreeing detns. should be taken. Results are given for lard prep'd. by V. and M. from the fats of animals killed in Paris and from animals from different parts of France, and also from pure com. lards supplied by reliable butchers. The m. p. of the glycerides of lards prep'd. with fat from only one part of an animal varied from 62-65°, except in one case (61.4°), which gave an abnormal oleorefractometric reading (-16.2°). Of the com. samples 2 gave 62.8° and the remainder 63° or over. The difference between the m.p. of the glycerides and of the fatty acids was 4.5-7°. If G is the m. p. of the glycerides and A that of the acids, $2G - A$ is equal to or greater than 68° for pure French lards; but very exceptionally lard prep'd. from only one part of an animal may show a value of 67-68°.

Ibid. 14, 86-92(1921).—The method was tested out on mixts. of pure lard with various other fats, and the following conclusions were reached: The method is sensitive to 5% for detecting beef or mutton tallow. It is equally sensitive when tallows are used along with fats containing a large proportion of liquid glycerides, *e. g.*, horse fat. It can be successfully applied to the detection of hydrogenated fish oils. With fats contg. a low proportion of solid glycerides, *e. g.*, horse fat and oleomargarines, it becomes applicable only in the presence of 20-30% of the adulterant; but it is hoped to obtain satisfactory results even in such cases by suitably modifying the method. Work is being continued. Also in *Ann. chim. anal. chim. appl.* 3, 208-15(1921).

A. P.-C.

Apparatus for testing the moisture content in butter. ALBERT BRUNO. *Ann. fals.* 13, 543-5(1920).—The app. consists of a hydrometer with a pan at the end of the stem. A small vessel filled with butter is placed on the pan, and the amt. of butter in it is adjusted so that the reading is exactly at zero (exactly 5 g. of butter). The water is then driven off by heating over a spirit lamp until the butter assumes a decided brown color. The vessel is replaced on the pan of the hydrometer, and the % of H₂O is read off directly on the stem of the hydrometer.

A. P.-C.

Phosphorus in butter. J. T. CUSICK. Cornell Agr. Expt. Sta., *Mem.* 30, 159-86(1920).—The method of treatment of milk and cream before churning influences the amt. and the form of P retained in butter. In churning about $\frac{1}{4}$ of the total P of cream is retained in the butter; the remainder is lost in the buttermilk, wash water, etc. In storage, the sol. org. P compds. broke down giving inorg. compds., the method of treatment of the cream before churning detg. the time for this change. Salt has a marked effect in bringing about protein decompn. during storage, even at a temp. of -10°. The breaking down of lecithin, and the forming of trimethylamine is the cause of fishy flavor in butter. When this occurs there is a loss of sol. org. P. A review of the literature is given.

J. J. SKINNER

Chemical technology of the frozen meat industry. A. M. WRIGHT. *New Zealand J. Sci. Tech.* 4, 74-83(1921).—A review, chiefly of the principles involved in conducting the mfg. processes of the meat industry, considering slaughter tests, frozen meats, changes and mold growth occurring during cold storage, meat canning and exts., and edible fats.

H. A. LEPPER

Commercial utilization of grape pomace and stems from the grape-juice industry. FRANZ RABAK AND J. H. SHRADER. Bur. Plant Industry. U. S. Dept. Agr., *Bull.* No. 952, 1-22(1921).—The principal products that can be obtained from the wastes which accumulate annually in large quantities at the various grape-juice plants are cream of tartar and tannin from the stems; oil, oil cake and tannin ext. from the seeds; and jelly from the skins. The economic possibilities of utilizing these wastes are discussed and a description is given of the best methods to be employed for this purpose. W. H. ROSS

The chemical composition of Texas honey and pecans. G. S. FRAPS. Texas Agr. Expt. Sta., *Bull.* 272, 9 pp.(1921).—Av. analysis of Texas honey gives: protein 0.36%; reducing sugars 75.71%; sucrose 1.17%; non-sugars 4.02%; H₂O 18.51%; ash 0.28%. Av. compn. of Texan pecan meats: meat in nuts 52.16%; proteins 10.66%; fat 72.44%; crude fiber 2.31%; N-free ext. 9.82%; H₂O 3.20%, ash 0.57%. Compn. of pecan hulls: P₂O₅ 0.05%; K₂O 0.39%; protein 1.94%; fat 0.55%; crude fiber 54.57%; N-free ext. 32.66%; H₂O 8.05%; ash 2.23%.

H. W. EASTERWOOD

Examination of some methods of ascertaining the purity of saccharin. PHYLLIS V. MCKEE. *J. Soc. Chem. Ind.* 40, 150-2T(1921).—Completely pure saccharin (S) melts at 227-227.5° (corr.) and solidifies and re-melts at the same temp., showing no decompn. M.-p. curves show that up to 10% *p*-sulfaminobenzoic acid depresses the m. p. of S normally, that the m. ps. of mixts. of *o*-sulfaminobenzoic acid and S cannot be relied upon as evidence of compn. and that *o*-toluenesulfonamide depresses the m. p.

of *S* normally. *S* purified by standard means (m. p. above 224°), dissolved in equiv. quantity of aq. NaHCO_3 , dild. with boiling H_2O (20 parts by vol. to 1 *S*) will ppt. pure (m. 227-227.5°) on addition of 5% HCl in 30-50% excess added slowly to the soln. kept at 80°. Large lustrous crystals sep. on slow cooling in a hot bath. The m. p. of *p*-sulfaminobenzoic acid was found to be 288-8° (corr.), on solidifying and re-melting 250°, showing decompn., which was not obvious on first melting. In estg. *S* by hydrolysis and titrating NH_3 formed; *p*-sulfaminobenzoic acid and *o*-toluenesulfonamide did not interfere, confirming the results of Proctor (*J. Chem. Soc.* 87, 242); neither did *p*-toluenesulfonamide or toluene-2,4-disulfonamide. Presence of *o*-sulfaminobenzoic acid interferes with estn. by hydrolysis in the original Proctor method as well as in the modification of Richmond and Hill (*C. A.* 12, 2215). For the detection and estn. of this acid see Richmond and Hill (*C. A.* 13, 979).

H. A. LEPPER

Baking powder. Louis WEIL. Strasbourg. *Ann. fals.* 13, 17-21 (1920).—After a brief and general discussion of baking powders W. lays down the following requirements: at least 3.5 g. of CO_2 should be liberated per kg. of flour; CaCO_3 should be used as a source of CO_2 only in powders containing no other Ca salts; the (free) H_2SO_4 should not be greater than 0.1%; the excess alkalinity (as NaHCO_3) should not be more than 1%; mineral fillers should not be used. A. P.-C.

The composition of egg powder. F. F. BEACH, F. E. NEEDS AND EDWARD RUSSELL. *Analyst* 44, 279-83 (1921).—Analyses of substances on the English market sold as "egg powders" show them to be essentially baking powders with no egg present, the chief org. constituent being rice starch. A suitable basis for a standard is proposed, constituted of rice and 10% dried egg, the analyses of which are compared to the analyses of dried egg and "egg powders." H. A. LEPPER

The freezing point of potatoes as determined by the thermoelectric method. R. C. WRIGHT AND R. B. HARVEY. Bur. Plant Industry. U. S. Dept. Agr. *Bull.*, No. 895, 1-7 (1921).—A detn. by a thermoelec. method of the f. p. of 18 standard varieties of potatoes grown under the same conditions showed that the f. p. varies with the variety and tends to rise as the season advances. Early and midseason varieties have a higher f. p. than late varieties. W. H. Ross

Discoloration in canned sweet potatoes. ED. F. KOHMAN. *J. Ind. Eng. Chem.* 13, 634-5 (1921).—The dark color of canned sweet potatoes is due to action of Fe of the can on a tannin-like substance which exists largely beneath the peel, and also to some extent near the center of the potato. The access of air to the can is a prerequisite to the formation of the colored con.pd. Air-tight cans will obviate trouble but peeling before or after cooking will not. H. A. LEPPER

Reduction in the strength of the mercuric-chloride solution used for disinfecting sweet potatoes. J. L. WEIMER. Bureau of Plant Industry, U. S. Dept. Agr. *J. Agr. Research* 21, 575-87 (1921).—The HgCl_2 solns. were made in a clean 50-gal. oak barrel by the use of 4 ozs. of HgCl_2 per 32 gal. of H_2O . The volumetric method of Jamieson for detg. HgCl_2 was used (cf. *C. A.* 13, 1194). A bushel of sweet potatoes, when treated in 32 gal. of 1-1000 HgCl_2 soln. in the manner generally used by farmers, reduces the strength of the soln. approx. 1%. The decrease in strength is due in part to the potatoes. The dirt and fibrous roots, the bags, hampers, etc., holding the potatoes, also the barrel holding the soln., removed a certain amt. of HgCl_2 from the soln. Washed sweet and Irish potatoes removed practically equal amts. of HgCl_2 . The soln. may be maintained sufficiently near its original strength for all practical purposes for the treatment of 50 bushels of potatoes by adding from 0.4 to 0.5 oz. of HgCl_2 and sufficient H_2O to make the soln. to its original vol. after each 10-bushel lot of sweet potatoes has been treated. F. C. Cook

Respiration and carbohydrate changes produced in sweet potatoes by Rhizopus

tritici. J. L. WEIMER AND L. L. HARTER. Bur. Plant Ind. U. S. Dept. Agr. *J. Agr. Research* 21, 627-35 (1921).—The relative rates of respiration as measured by the CO_2 given off by 2 halves of yellow Jersey sweet potatoes, one of which was rotted by *Rhizopus tritici*, were detd. The changes in the starch, cane sugar and reducing sugar contents of the corresponding halves at the end of the expt. were also detd. The respiration chambers were kept at 30° and the CO_2 was detd. every 24 hrs. Decay of the inoculated part was complete in 3 days. The sugars were then extd. from the pulp with 70% EtOH, the pulp was then dried to const. wt. at 60° . A sample of the dried pulp was hydrolyzed with HCl and the starch detd. as reducing sugar. The % of H_2O in the pulp was detd. at the close of the respiration study. Expts. were also made with a modification of Czapek's nutrient soln. and 1% of glucose and cane sugar alone and in combination as the only source of C. The solns. were inoculated and the fungus was grown for 17 days. The loss of sugars and the amt. of fungus material produced are given. The decayed halves of the sweet potatoes gave from 6.3 to 7.8 times as much CO_2 as the healthy halves. Smaller amt.s. of starch, cane sugar and total sugars were found in the decayed than in the healthy samples. The total quantity of carbohydrates lost in the decayed samples was greater than that required for respiration as shown by the CO_2 detd. It is apparent that a portion of the carbohydrates was utilized in other processes, such as the production of fungus material, acids, alcs., etc. A reduction of the starch, cane sugar and total sugars was also found when the fungus was grown on cooked (sterile) potatoes. In Czapek's nutrient soln. glucose was utilized when it was the only source of C available. When glucose and cane sugar were combined in the soln. there was a reduction only in the amt. of cane sugar. When cane sugar was the only available source of C it was apparently not used by the fungus to any extent.

F. C. COOK

The adulteration of canned spinach by means of beet leaves. R. COLLIN AND L. GOBGET. *Ann. fals.* 14, 100-4 (1921).—The adulteration of canned spinach (*Spinacia Oleracea L.*) with beet leaves (*Beta vulgaris L.*) is best detected by microscopic examin. The chief macroscopic and microscopic characteristics of the two are briefly described.

A. P.-C.

Vegetable catalase. Application of catalase in alimentary hygiene. M. BORNAND. *Mitt. Lebensm. Hyg.* 12, 125-33 (1921).—Wheat flour in the different states of milling was studied. To 5 g. of flour, add 15-20 cc. of soln. of glycerol (50%), shake 3-5 min., let stand 15 min. and filter on paper. To 1 cc. of filtrate in a watch glass add 4-5 drops of 3% soln. of H_2O_2 . The quantity of catalase is roughly estd. by the appearance of the bubbles. Results show that flour coming from the central part of the wheat grain contains only traces of catalase, but com. flour contains particles of the aleurone layer and bran and therefore reacts strongly positive. Rye flour gives the same results as wheat. Corn meal, rice and potato starch contain none while the flours of legumes (beans, yellow and green peas, and lentils) contain the most. Barley, oat, and chestnut flours contain only a little. Catalases of all flours studied do not decompose H_2O_2 if heated 10 min. at 100° or 30 min. at $60-65^\circ$. The interpretation that the presence of catalase in flours shows spoilage can only be of value with corn meal, rice and potato as these react negative when fresh.

H. A. LEPPER

The carbohydrate content of the navy bean. W. H. PETERSON AND HELEN CHURCHILL. *J. Am. Chem. Soc.* 43, 1180-5 (1921).—Analysis of a 1917 sample of com. navy beans gave the following % (referred to the air-dried beans): moisture 12.96, ash 3.88, Et₂O ext. 1.83, protein 18.42, total sugar 1.59, starch 35.20, pentosans 8.37, galactans 1.33, dextrins 3.71, hemicelluloses 0.83, true cellulose 3.11, org. waxes, etc. (by difference) 8.77. Of the pentosans about 30% appears in the malt ext. and small amt.s. in the alc. and HCl exts., but about 50% remains undissolved in these solvents. A 1919 sample

of the beans gave 8.87% moisture, 61.8% N-free ext. and 50.5% starch. The completeness of the digestion by malt diastase was greatly enhanced by fine grinding (10-12% increase in digestible starch in a sample ground to an impalpable powder as compared with a sample ground in an ordinary feed mill). The I test for starch is not a satisfactory means of detg. when to stop the digestion; after 10 hrs. digestion with several additions of malt ext. the residues still give a blue color. The amt. of starch obtained after 10 hrs. digestion is but little greater than that obtained after 4 hrs. To obtain a comparison of the starch content of navy beans with that of some other legume seed, two varieties of peas (Alaska Garden and Canada Field) were also analyzed, with the following results, resp.: moisture, 10.36, 8.60; Et₂O ext., 1.13, 0.81; crude fiber, 5.74, 4.44; protein, 19.63, 28.48; ash, 2.88, 3.20; N-free ext. (by difference), 60.26, 54.57; of the N-free ext., more than 80% was starch.

C. A. ROULLER

Rice pollard. L. GOBERT. *Ann. fals.* 14, 226-30 (1921).—Rice husks have recently reappeared on the Fr. market under the name of "rice pollard," contg. about 8% H₂O and 27-32% ash. It is a sandy-grey impalpable powder, slightly unctuous to the touch at first, becoming very slightly granular. Microscopic examn. showed it to contain: the various constituents of rice husks in an extremely fine state of division; rice starch; fine, shapeless particles of mineral origin. Some of the mineral particles might readily be mistaken for infusorial earth; but comparison with known material showed that they were due to the siliceous matter of the ground rice husks. The ash contains 89.7% SiO₂. Its use as a stock food is dangerous.

A. P.-C.

Composition, action and analysis of baking powders. A. KLING, A. LASSIEUR AND L. VERNERD. Lab. Municipal de Paris. *Ann. fals.* 13, 9-17 (1920).—A review of various articles published in *Z. Nahr. Genussm.* in 1917-8-9.

A. P.-C.

Relation of hardness and other factors to protein content of wheat. HERBERT F. ROBERTS. Univ. of Manitoba. *J. Agr. Research* 21, 507-22 (1921).—The methods of the (1) Kansas, (2) Kentucky and (3) California Agr. Expt. Stations for testing hardness of wheat are discussed. The correlation between the crushing or breaking point of the kernel in g. and the % of protein, the data from the 3 stations being used is calcd. The consistently negative results obtained seem inexplicable in the light of the generally accepted belief that the harder wheats are usually higher in protein. The correlation coeff. between sp. gr. and protein and between vol. of the grain and protein was also detd. In obtaining the Kansas data 94 pure strains of Kansas grown wheat were used.

F. C. COOK

The influence of cold and hot pressing on the digestibility of albumin. JOH. A. EZENDAM. *Oliën en Vetten* 6, 53 (1921).—Examn. by the Royal Agr. Proving Station at Wageningen, Holland, of samples of linseed cake obtained from 3 different factories gave the following results, the first figure being % of albuminous material, the second % of digestible albuminous material and the third % of digestibility of the albuminous material. Factory U. Cold pressed, 29.0, 26.2, 90.4; hot pressed (101°), 29.3, 26.7, 91.1; normal pressed (82°), 29.4, 26.5, 90.2. Factory S. Cold pressed, 30.1, 27.4, 91.0; hot pressed (88°), 30.7, 27.8, 90.6; cold rolled, 31.1, 28.1, 90.7; half hot rolled (37°), 31.1, 28.6, 92.3; hot rolled (62°), 31.1, 27.6, 89.0. Factory A. Cold pressed, 30.2, 27.8, 92.1; normal pressed (57°), 30.2, 27.6, 91.4; hot pressed (84°), 30.7, 27.6, 89.9; normal pressed (61°), 31.2, 28.5, 91.4; cold rolled, 30.4, 27.7, 91.1; hot rolled (60°), 30.6, 27.8, 90.9.

NATHAN VAN PATTEN

The toxicity of cacao shells. FONZES-DIACON. *Ann. fals.* 13, 34-5 (1920).—F. D. confirms the observation of Marchadier and Goujon (*C. A.* 13, 3244). In Oct. 1918 horses manifested violent excitation as a result of the daily ingestion of about 700 g. of cacao shells contg. 0.7% theobromine. Some of the horses died as a result; but on stopping the cacao shell ration all trouble of this nature ceased.

A. P.-C.

The lime content of egg albumin. HANS KREISS AND JOSEPH STUDINGER. Lab. de Chimie du Canton de Bâle. *Rev. pharm. Suisse*, 14 (Apr. 7, 1921); *Ann. fals.* 14, 148-51 (1921).—The CaO content of the albumin of fresh eggs varies from 0.59 to 4.25 % of the ash. Even after standing for several months in lime water, eggs do not change in wt. and their CaO content does not increase. The detn. of CaO in egg albumin gives no indication as to whether or not it was preserved in lime water. In eggs preserved with CaO the skin enveloping the yolk becomes very fragile in a relatively short time. Hence, if the yolk envelope is very fragile it is safe to infer that the egg is not fresh. Moreover, the sp. gr. indicates whether an egg is fresh or not. In eggs in which the envelope of the yolk is fragile, the sp. gr. does not tell if it has been preserved in CaO; but it does tell whether it has been kept in air or in some liquid, as in the former case the sp. gr. decreases considerably and in the latter it remains const. A. P.-C.

The hydrocyanic acid content of linseed cake. E. KOHN-ABREST. Chef du Laboratoire de Toxicologie à la Préfecture de Police. *Ann. fals.* 13, 482-7 (1920).—The HCN content of material contg. cyanogenetic glucosides is detd. as follows. The sample (usually about 50 g.) is ground and mixed with 10 vols. of H₂O in a flask having a capacity about 4-5 times as great as the vol. of the mixt. It is allowed to stand 4 hrs. at 37-40° or 24 hrs. at room temp., cooled, acidified with 2 cc. of concd. HCl for every 100 cc. of liquid. The flask is connected to a condenser, the end of which dips down into a few cc. of H₂O, and distn. is carried on in a CaCl₂ bath until about a quarter of the mixt. has distd. over. The distillate is rendered slightly alk. and just acidified with CO₂ (litmus paper being used) and titrated with a standard soln. of I in KI. The residue from the distn. is treated with a vol. of concd. HCl equal to 0.1 of the original vol. of the mixt., and distn. is continued until three-fifths of the original vol. has been collected. The distillate is titrated as above, giving the amt. of HCN which had not been liberated by maceration in cold water. Twelve samples of linseed from different sources gave 0.0107-0.0310% total HCN, which is very close to the values usually obtained for Burma beans. Linseed cakes gave 0.038 and 0.0297%. They should therefore be subjected to the same restrictions as beans, and even the max. allowed at present (200 mg. HCN per kg.) should be reduced to 100 mg. In the case of material to be used exclusively for animals, the max. may be 200 mg. (See following 3 abstracts). A. P.-C.

The hydrocyanic acid content of linseed cake. BARISHAC. *Ann. fals.* 13, 487-9 (1920); cf. preceding abstract.—Waste pulp from a benzaldehyde factory, consisting of about 70-5% H₂O and 25-30% apricot kernel or bitter almond press cake and contg. up to 0.25-0.30% HCN (on the dry basis), was fed to cattle for over 15 yrs. at the rate of about 2.5 kg. of dry cake a day. No trouble was ever experienced, and the milk secretion was increased. A. P.-C.

Hydrocyanic acid content of linseed cake. CH. BRIOUX. Station agron. de la Seine-Inférieure. *Ann. fals.* 14, 23-7 (1921); cf. 2 preceding and following abstracts.—B. contends that linseed cake yielding as much as 250 mg. HCN per kg. should not be condemned as cattle food, and bases his arguments on the results of Auld (*C. A.* 8, 588) and of Collins and Blair (*C. A.* 7, 1373; 8, 1838). A. P.-C.

Cyanogenetic glucosides in linseed oil cake. ROTHÉA. *Ann. fals.* 14, 142-8 (1921); cf. 3 preceding abstracts.—Reply to Brioux based on the essential differences between the digestive processes of ruminants and of other animals. A. P.-C.

Experiments on wheat growing in the Sudan. F. G. MARTIN AND R. E. MASSRY. Sudan Gov., Chem. Sec., *Publ.* 19, 24 pp.—The protein content of flour made from 3 varieties of wheat grown in Sudan varied from 9.8% to 10.9%. Federation variety proved most valuable. J. J. SKINNER

Nitrogen and other losses during the ensiling of corn. R. H. SHAW, P. A. WRIGHT AND E. F. DEYSHER. Bur. Animal Industry. U. S. Dept. Agr., *Bull.* 953, 1-19

(1921).—The losses which take place during the ensiling of corn were studied by burying analyzed samples of silage in cheesecloth sacks at various depths and positions in the silo as it was being filled. During the fall and winter months as the silage was fed, the samples were recovered and analyzed again. A comparison of the results obtained show that there is a down-wash of the juice on the silo which carries with it sol. food materials so that the silage in the lower part of the silo may gain in food material at the expense of the upper part. The av. loss of dry matter for all the bags amounted to nearly 10%, due apparently to the fermentation of the carbohydrates and to the carrying away of sol. material by the juice which was collected at the bottom of the silo. Reducing and non-reducing sugars almost entirely disappeared, while a considerable loss in crude fiber and in furfural-yielding bodies also occurred. The observed loss in total N may have been due entirely to the nitrogenous compds. which escaped in the juice. This juice, which amounted one season to 10,000 tons, contained 0.263% total N, 0.0283% albuminoid N, 0.03179% NH₃-N and 0.1473% amino N. W. H. Ross

The composition and digestibility of sudan grass hay, darsø, darsø silage, broom corn seed and sunflower silage. C. T. DOWELL AND W. G. FRIEDEMANN. Okla. Agr. Expt. Sta., *Bull.* 132, 8 pp. (1920).—The chem. compn. of each of the materials is given and digestion experiments are made with sheep. The % of protein digested was for sudan grass, 46.8; darsø, 56.5; darsø silage, 10.2; and broom corn seed, 33.9.

J. J. SKINNER

Composition of Arizona feeding stuffs. A. E. VINSON, C. N. CATLIN, AND S. W. GRIFFIN. *Arizona Agr. Expt. Sta., 30th Ann. Rept.* 1919, 411-2; *Expt. Sta. Record* 44, 568.—This is a table giving the proximate compn. of the following materials: Sorghum silage, feterita silage, darsø silage, mixed sorghum and hegari silage, corn silage, alfalfa hay, cowpea hay, wooly foot (*Bouteloua eripoda*), spruce top grama (*B. bromoides*), *B. rothrockii*, *B. curtipendula*, cotton top (*Panicum lacanthum*), tangle top (*Heteropogon contortus*) *Calycoseris wrightii*, Spanish dagger, elephant grass, *Chlorochloa*, sp., poppies, poppy pods, Indian wheat (whole plants and seeds), cottonseed meal, barley, cracked milo, and cracked hegari. The protein content in two other samples of grama grass is also given.

A. A. RILEY

Experiments on the food value of whale meal for poultry (ANON) 11E. Relative digestibility of various preparations of the proteins from the Chinese and Georgia velvet beans (WATERMAN, JONES) 11E. Cause and prevention of rancidity (KERR) 27. Chilling and mixing fats (U. S. pat. 1,380,777) 27. Classification and identification of coal-tar colors (BORDAS) 25.

ORLA-JENSEN: *Dairy Bacteriology*. Philadelphia: P. Blakiston's Sons and Co. 180 pp. \$3.00.

VULTE, HERMANN T. AND VANDERBILT, SADIE B.: *Food Industries*. An Elementary Text-Book on the Production and Manufacture of Staple Foods. Easton, Pa.: The Chemical Publishing Co. 325 pp. \$3.00.

Curing meat. F. W. KURK. U. S. 1,380,068, May 31. Meat is pickled in a soln. of NaCl and KNO₃ while subjected to the action of an active culture of a non-putrefactive, non-pathogenic, nitrate-reducing micrococcus. U. S. 1,380,069-70 relate to similar processes.

Dehydrating vegetables. W. B. McLAUGHLIN. U. S. 1,380,489, June 7. Tomatoes or other vegetables are partially dehydrated, leaving 30% or somewhat more of H₂O in the partially dehydrated material, packed in containers, freed from air, sterilized with steam and sealed.

Pectin. R. H. MCKEE. U. S. 1,380,572, June 7. Apples, guava or similar fruit are heated to 125° for several min. with about an equal wt. of H₂O, the fibrous material is sepd. from the resulting mush, finely divided absorbent C is added to the soln. thus obtained, the soln. is evapd. *in vacuo* and sepd. from the C. The material thus obtained is suitable for use in jellies, jams or marmalades.

Food from fresh blood. F. SGALITZER. U. S. 1,380,427, July 7. An easily digestible, durable and sol. prepn. is obtained from blood from which fibrin has been sepd. to prevent coagulation, by disrupting the blood corpuscles, and then evapd. *in vacuo* at a temp. of about 30° and drying the evapd. material at a temp. not exceeding about 40° *in vacuo*.

Conditioning flour with chlorine and peroxides. E. C. SUTHERLAND. U. S. 1,381,079, June 7. Meal or flour is treated with sufficient Cl to react upon the enzymes present and render them inactive and is then treated with H₂O₂ and exposed to ultra-violet light to produce nascent O which acts as a bleaching and improving agent.

Treating meal or flour with hydrogen peroxide. E. C. SUTHERLAND. U. S. 1,380,334, May 31. Meal or flour (or cereals, beans or tubers) is improved in color and baking qualities by treating it with about 0.7% its wt. of a 3% soln. of H₂O₂ and then exposing it in a thin layer, on a traveling belt conveyor to the action of actinic rays.

Leaven. R. NACHIMENTO. U. S. 1,380,828, June 7. A leaven adapted for use in making bread is formed by boiling about 2 lbs. of potato peelings in sea water for about 25 min., separately boiling about 4 oz. of hops, mashing the skins and thoroughly mixing with them about 3 lbs. of sugar and 3 cupfuls of wheat flour, adding the hops and hot H₂O, mixing cream of tartar and Na₂CO₃ with the mass, adding more sea water and setting the material to rise.

Concentrating grape juice. E. MONTI. U. S. 1,379,470, May 24. Grape juice is concd. to about 1.20 sp. gr. by freezing it while in contact with air. The juice is kept cold and in contact with air until the flavor improves and a portion of the juice is then further concd. to a content of about 90% dry ext. at a temp. of 40° or lower. This highly concd. portion of the juice is then mixed with the remainder of the juice to produce a mixt. contg. 75-80% of dry ext. and the mixt. is permitted to crystallize to form a product having the consistency of honey and the flavor of grape juice.

Apparatus for pasteurizing milk. J. M. MANLEY. U. S. 1,380,230, May 31.

Method of heating milk or other liquids during sterilization or pasteurization. A. MÜLERTZ. U. S. 1,379,875, May 31. Gradual heating and gradual cooling of the liquid is effected as it flows through vertical pipes.

13—GENERAL INDUSTRIAL CHEMISTRY

HARLAN S. MINER

Industrial benefits of research. CHARLES L. REESE AND A. J. WADHAMS. *Nat. Research Council, Reprint Circ. Series 18*, 13 pp. (1921). E. H.

The development of chemical industries in India. H. E. WATSON. *J. Indian Inst. Sci.* 4, 223-39 (1921). E. H.

Chemical industries of Japan. GÖSTA ANGEL. *Svensk Kem. Tid.* 33, 134-8 (1921).—A digest of the development of the chemical industries in Japan. A. R. R.

Engineering costs. FRANK WALKER. *Beama* 8, 318-25 (1921).—Detailed exposition with many charts and tables. C. G. F.

Chemistry and marine engineering. KENNETH P. CLARK. *Beama* 8, 153-8 (1921).—“Chemistry is an absolute necessity for a marine engineer.” The following processes and problems are dealt with at length: Combustion, corrosion and explosion of gases. C. G. F.

The importance of the back pressure steam engine for the chemical industry. FR. BÜRK. Mannheim-Waldhof. *Chem. App.* 8, 65-7, 126-9(1921).—A discussion of the advantages of this type of engine when used in combination with heating and concg. app. J. H. MOORE

Vacuum drying. CHAS. O. LAVETT AND D. J. VAN MARLE. *J. Ind. Eng. Chem.* 13, 600-5(1921).—Principles of operation and description of shelf, rotary and drum vacuum driers are given with illustrations. Application and limitations of each type are explained together with comparative data on drying costs. A. R. A.

Study of the fundamental laws of filtration using plant-scale equipment. FRED. P. BAKER. *J. Ind. Eng. Chem.* 13, 610-12(1921).—Theory, derivation and practical application of W. K. Lewis' fundamental filter equation are discussed. Tests were made on com. filter presses to study the filter equation and to det. consts. for defecated sugar solns. The use of the equation in designing filters is shown. For sludges containing compressible solids a constant rate of flow through filter is markedly superior to operation under const. pressure. A. R. ALBOUZE

Distillation methods and accomplishments in separation. FR. FRANK. Berlin. *Z. angew. Chem.* 34, Aufsatzteil, 330-40(1921).—This article is historical and descriptive. It traces the development of distn. from its earliest days to the present rectifying columns, and continuous, vacuum and steam distn. The application of the column to the coal and wood tar, alc., glycerol, petroleum, and numerous other industries is described. C. C. DAVIS

Multiple-effect evaporation. BURTON DUNGLINSON. *Chem. Met. Eng.* 25, 110-5(1921).—The development of evapg. processes to multiple-effect design is traced, the principles underlying evaporators are discussed and the inherent difficulty of obtaining materials of good color, free from decomprn. products (formed by necessity of maintaining large vols. of soln. for long times at their finished d. and at high temps.) is given as reason for expts. to increase velocity of liquid in heating tubes, producing a concd. product, and removing all liquid as soon as this concn. is reached. In the "Multiplex" type of evaporator the quantity of liquid used at a charge is small. The soln. remains in contact with hot tubes only 1 or 2 min., and then is drawn off through a foam separator into the next effect, which is at a lower temp. and higher vacuum. Tubes used are short—not more than 6 ft. in length. Comparisons of coil type, vertical-tubular, horizontal-tubular and multiplex evaporators are given, both with respect to construction and efficiency. W. C. EBAUGH

Lubricants for special purposes. ANON. *Elektrochem. Z.* 27, ii, 67(1921).—A review. C. G. F.

Importance of Montan wax for lubricant factories. H. POMERANZ. *Kunststoffe* 10, 85-6(1920).—A satisfactory, though dark colored, lubricant is obtained by dissolving the soap from montan wax in mineral oil in the proportion of 1:7 to 1:8. Such a product begins to drop at about 80°. This is best prep'd. by sapon. of a mixt. of montan wax and mineral oil. The effect on metals is not known. C. J. WEST

The proper lubrication of ball bearings. H. BURRIE. Société des Roulements à Billes SKF. *Industrie chimique* 8, 276-7(1921).—The function of lubrication in ball bearings is the protection against corrosion and facilitating the longitudinal motion of the journal when such is required. The lubricant must be free from acids and alkalies (max. 0.1%), lime (max. 0.5%), resins, and all traces of impurities which might cause friction. The best lubricant is a high grade oil of suitable viscosity (depending on the nature of the work). If grease is used it must not melt at the temp. of the bearing. Graphite should never be used for lubricating ball bearings. Simple tests for detecting acidity, alkalinity, and resins, and for detg. m. p. are given. A. P.-C.

Corrosion test for lubricating oils. H. G. SMITH. *Petroleum Age* 8, No. 8, 48

(1921).—Strips of polished Cu are inserted into a bottle contg. 100 cc. of oil to be tested and held firmly in place by a cork. The bottle is placed in a water bath which is maintained at the b. p. for 5 hrs. without disturbing the bottle. Any darkening of the Cu strip is due to S or corrosive S compds. while any diminution of the polish or appearance of a dull reddish color on the submerged surface indicates the presence of acids or of acid compds.

R. L. SIBLEY

Viscosities at high temperatures of California and Eastern lubricating oils. T. F. Orr. *Nat. Petroleum News* 13, No. 31, 90(1921)—Oils made from asphalt base crudes have very high viscosities (300 to 500) at 100° F. while oils from paraffin base crudes have a much lower viscosity (150 to 240) at the same temp. The viscosity of the latter, however, drops at a slower rate than that of the former on heating so at the working temp. of the cylinders of an internal combustion engine they are approximately the same.

Table of comparative viscosities:

Oil	100° F.	130° F.	170° F.	210° F.	300° F.
California light	220	101	57	43	35
Pennsylvania light	150	85	55	42	34
California medium	350	143	70	48	37
Pennsylvania medium	220	113	66	46	36
California heavy	600	220	90	56	39
Pennsylvania heavy	400	191	90	56	38

R. L. SIBLEY

Trinitrotoluene as an industrial poison (HAMILTON) 11H. Photoelasticity for engineers (COKER) 13.

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NASKE, CARL: Zerkleinerungsvorrichtungen und Mahlanlagen. Leipzig-Reudnitz: Otto Spamer. M 25.

SPRINGETT, BERNARD H.: Cold Storage and Ice Making. London. New York: Sir I. Pitman and Sons.

Recovery of solvent vapors. A. S. O'NEIL. U. S. 1,381,002, June 7. Mixts. of solvent vapors such as acetone or alcs. with air are recovered in a closed app. in which temp. differences and gravity are employed to cause the solvent-laden gas to travel downwardly through a tortuous passage in contact with refrigerated liquid solvent.

Protecting fused materials with flue gases. H. H. Dow. U. S. 1,379,619, May 31. In fusing together reacting materials such as org. compds. with NaOH, the fusion mixt. is protected from oxidation by blanketing it with a layer of flue gases. The latter may be first purified with Mg(OH)₂.

14—WATER, SEWAGE AND SANITATION

EDWARD BARTOW

To vote on \$4,000,000 filter project at Buffalo. ANON. *Eng. News-Record* 87, 167(1921).

FRANK BACHMANN

U. S. Public Health engineer urges filters for Milwaukee. R. E. TARBETT. *Eng. News-Record* 87, 167(1921).—Conclusions agree with those of H. P. EDDY who recommended filtration immediately regardless of program of sewage purification. F. B.

Investigation of tastes and odors in the Cleveland water supply. J. W. ELLMS AND W. C. LAWRENCE. *Eng. News-Record* 86, 1039(1921).—The cause of the tastes and odors was due to waste liquors from the ammonia stills by by-product coke-oven plants. Phenol, although in minute quantities in these liquors, produced foul tasting and smelling compds. if the waste entered the waterworks intakes and came in contact with Cl applied to the water for disinfecting purposes. FRANK BACHMANN

Water purification at Columbus, Ohio. CHARLES P. HOOVER. *Columbus, O., City Bull.* 6, No. 20, 13-22(1921); cf. *C. A.* 14, 2388.—During 1920 the av. hardness was reduced from 266 to 109 p.p.m. Bacteria were reduced from 2400 to 19 per cc. The typhoid fever rate in the city was only 2.5 per 100,000. Methods of detg. the amt. to use of lime, soda ash, and alum are given. Specifications are given for lime, soda ash, bauxite, H_2SO_4 , and chloride of lime. Alum is made at the plant. Expts. with prevention of growth on the sand grains and strainers indicate that phosphoric acid is the most satisfactory agent. Tables showing results of operation are given. Also in *Public Works* 51, 123-5(1921).

EDWARD BARTOW

Analysis of water from Manvers main colliery, Wath, Rotherham. JOHN H. PAYNE. *Naturalist* 1917, 386. E. T. WHERRY

Iodine and arsenic in the underground waters of the Argentine Republic. F. REICHERT AND R. A. TRELLES. *Anales asoc. quim. Argentina* 9, 80-5(1921).—Complete analyses of 15 different waters are given. Iodides and As compds. are present in several. L. E. GILSON

Thermal ferruginous carbonated water from the central basin of Agnano (Naples). A. PIUTTI AND E. COMANDUCCI. *Rend. accad. sci. Napoli* 27, 80-4(1921).—The sample was taken from the bottom of a lake 1.45 m. deep, the water escaping from two openings and being accompanied by a large amt. of gas. The water has a temp. of 38.5°, and is of a yellowish color, somewhat turbid, but soon clarifies on standing, and deposits a reddish ppt. The reaction is slightly alk. to litmus, and no odor develops, even on heating with alkalies, while the taste is pleasant, slightly saline and acidulous. The gas consisted of CO_2 75%, O_2 5%, unabsorbed gases 20%. The dissolved gas was 645.2 cc. per 1000 g. of water at 15°. The probable compn. of dissolved substances per 1000 g. of water, d_{15} 1.0045, is: free CO_2 0.63865 g., N_2 0.0585 g., O_2 0.0154 g., SiO_2 0.1248 g., KCl 0.3278 g., $NaCl$ 0.37371 g., Na_2SO_4 0.98146 g., $CaSO_4$ 0.10096 g., $NaHCO_3$ 0.4727 g., $Ca(HCO_3)_2$ 0.12148 g., $Mg(HCO_3)_2$ 0.33501 g., $Fe(HCO_3)_2$ 0.03858 g., $Al(HCO_3)_3$ 0.44521 g., with traces of P_2O_5 , NO_2 , Ti , Sr , Li and org. matter. M. R. SCHMIDT

The nutrient content of water supply and its utilization. H. FISCHER. *Naturw. Z. Forst u. Landw.* 18, No. 3-4, 66-83(1920); *Expt. Sta. Record* 43, 728.—Analyses of lake, river, and pond waters of Germany are reported and discussed, with particular reference to their content in potash, phosphoric acid, N, and lime. H. G.

The tolerable limits of the contamination of the Weser River water by wastes from the potash industry. KERP. *Arb. Reichsgesundh.* 51, No. 2, 239-389(1919); *Expt. Sta. Record* 42, 719.—A rather extensive study is reported of the contamination of the water of the Weser River in Germany from the waste products of potash industries. It was found that fish life was not materially injured until a hardness degree of 110 was reached in a concn. of Cl of 2,000 mg. per l. The injury to agricultural lands overflowed by the river waters, while not very marked, was found to be mainly due to the influence of the potash by-products on the physical condition of the soil. It is concluded, however, that the potash industry should continue to take steps toward the safe disposal of the waste products without permitting them to flow into the river water, and exten-

sive recommendations as to the permissible limits governing such practice and methods of disposal are given.

H. G.

Graphic representation of the chemical composition of natural waters. ENRIQUE H. DUCLOUX. *Mem. Acc. Cienc. Artes Barcelona* 15, 271-4 (1919); *Rev. géol.* 1, 498 (1920).—Diagrams such as are used in petrography are applied to the projection of data on the compn. and potability of water.

E. T. WHERRY

Lead in peaty waters. THOMAS TICKLE. *Analyst* 46, 240 (1921).—Add KMnO_4 to the water to a distinct pink. Make it alk. with NH_4OH and let it stand for 48 hrs. Filter, dissolve the ppt. in concd. HCl and test with alkali sulfide in the usual way.

NICHOLAS V. S. MUMFORD

Bacillus welchii as test for safe water and cause of water-borne diarrhea. Eng. News-Record 86, 929-34, 998-1003 (1921).—The almost unanimous opinion of the sanitarians throughout the country is that proof is lacking that *B. welchii* as found in water causes intestinal trouble. The test for this organism is considered without value. *B. coli* tests are considered standard for detg. the quality of water supplies. F. B.

The determination, calculation and significance of the hydrogen exponent in the analysis of potable waters. I. M. KOLTHOFF. Utrecht. *Pharm. Weekblad* 58, 1005-20 (1921); *Z. Nahr. Genussm.* 41, 112-22 (1921).—The H electrode is not applicable to the detn. of p_{H} in potable waters, except with such special appliances and precautions as to render the method unsuitable for routine work. Colorimetric methods are simpler, cheaper and more accurate in the usual potable water range of p_{H} (7-8). A procedure which is especially suited to field analyses is the wedge method: Fill a wedge (capacity about 15 cc.) with H_2O contg. 0.5% of 4 *N* HOAc and 0.5% of a 1% soln. of neutral red in aq. alc. (acid wedge); and a similar wedge with 50% glycerol contg. 1% of 6 *N* NH_4OH and 1% of a 1% soln. of neutral red (alk. wedge). Cement them together with Canada balsam. Only about $\frac{2}{3}$ of the length should be used for comparison. This simple color standard is useful in the range 6.8-8.0. It should be protected from light as much as possible. The p_{H} value has little significance in water analysis except as an aid in calcg. the amt. and state of combination of CO_2 in the water. The calcn. of p_{H} from measurements of H_2CO_3 and HCO_3^- content is discussed. J. F. S.

A note on the hydrogen-ion concentration of some natural waters. J. T. SAUNDERS. Proc. Cambridge Phil. Soc. 20, 350-1 (1921).—The waters under discussion all occur in districts where the soil or subsoil contains chalk, gault or lime in some form. Waters from such districts have a fairly const. H-ion concn.; ground water, springs or wells vary within the limits 7.1-7.2 p_{H} . As the water leaves the source and flows along the stream the p_{H} increases gradually to 8.25-8.5, remaining const. Where the stream becomes sluggish, there is a drop in p_{H} due to the acid products of decomprn. from the stream bottom. In ponds and lakes which are large and deep so that there is no general mixing of water the p_{H} is const. within the limits 8.25-8.5. In small shallow ponds the p_{H} does not remain const.; there may be a lowering as in the case of a sluggish stream or an increase in the presence of much vegetation.

M. C. PERRY

Boby water softeners. ANON. Water and Water Eng. 23, 173-4 (1921).—A description of a 5000 gal. per hour water softener made by Wm. Boby and Son, London. Crude water flows into a tipping bucket where it is violently agitated with reagent previously added by adjustable-capacity reagent cup. Tipping of the filled bucket actuates a mechanism lowering a reagent cup into a tank of the reagent and the return of the bucket to a filling position raises the cup and dumps it. Water passes down through a tube to the bottom of a reaction chamber 44 ft. high and 10 ft. diameter. Upward filtration is through wood fiber at top. Reagent is prepared in 24-hr. quantities at ground level.

J. J. H., JR.

Clinton, Iowa, water supply and the Mississippi River. RUSSELL MORGAN. Chem.

News 123, 19-20(1921).—Comparative mineral and sanitary analyses of the water from the Mississippi River and from the wells 1800 and 2200 feet deep of the Clinton Water system have been made. Similarity is claimed. **J. J. HINMAN, JR.**

Soap solution for the estimation of hardness. **A. KRIEGER.** *Chem. Ztg.* 45, 559-60(1921); cf. *C. A.* 15, 1773.—The sediment which seps. from soap solns. on standing is due largely to the oxidation of EtOH to AcOH. Fatty acids are thus thrown out of soln. and the titer is destroyed. Rape seed and coconut oils when saponified with KOH, the fatty acids ptd., and again neutralized with KOH, did not give satisfactory testing soaps. A concd. soln. was prep'd. by dissolving 20 g. K soap (Merck's) in 50 cc. distd. water and dilg. to 700 cc. with 94% EtOH. This soln. when standardized against BaCl₂ soln. was found to be exactly 10 times as strong as the *N* standard Clark soln. The following figures for cc. 10 *N* soap soln. are followed by figures designating degrees of hardness: 0.05, 0°; 0.50, 0.8°; 1.00, 2.0°; 1.50, 3.4°; 2.00, 4.8°; 2.50, 6.3°; 3.00, 7.6°; 3.50, 9.0°; 4.00, 10.5°; 4.50, 12.0°; 5.00, 13.5°; 6.00, 16.5°; 7.00, 19.6°; 8.00, 23.4°. The soln. is accurate for all work and a saving of EtOH is effected. Isopropyl alc. gave no better results than EtOH. **G. C. BAKER**

The Wartha method for the estimation of hardness in water. **G. BRUHNS.** *Z. angew. Chem.* 34, Aufsatzeil, 279(1921).—B. criticizes an article by Winkler (*C. A.* 15, 1050, 2320) and suggests the following modifications: 150 cc. of the water are titrated with 0.1*N* HCl until a red color is produced with methyl orange. If more than 8 cc. of the acid are required, the CO₂ produced by its action on the bicarbonates is removed by air or suction. Often the color fades and more acid is added to bring back the end point which becomes much sharper. This gives a more accurate detn. of the carbonate hardness. The treated water is then placed in a 250-cc. volumetric flask and a little ptd. CaCO₃ added and after thorough shaking 25, 50 or 75 cc. of Wartha's soln. are added, according to the hardness (detd. by preliminary tests) and the flask is filled to the mark with distd. water. The mixt. is shaken and let stand until at least the upper $\frac{1}{2}$ or $\frac{2}{3}$ is clear. (about 1 hr.). The CaCO₃ crystals grow and, owing to their greater wt., settle to the bottom, also carrying out the ptd. Mg(OH)₂. A fraction of the clear portion may be pipetted out and the alkalinity detd. For exact detns. it is recommended that the CO₂ produced be removed. B. proposes a measuring flask of the form of an Erlenmeyer flask instead of the cylinders suggested by Winkler. **G. C. BAKER**

The small plant operator as scientist. **ABEL WOLMAN.** *Eng. News-Record* 86, 1039(1921).—W. points out that all operators are scientists as the water they treat is different from any other and it is their duty to investigate the conditions under which it is amenable to satisfactory treatment. **FRANK BACHMANN**

Licensing water purification plant operators in New Jersey. **CHARLES H. CAPEN, JR.** *Eng. News-Record* 86, 1041-2(1921).—The N. J. laws require that every purification plant must have a licensed operator, but that licenses should be issued to all operators holding their positions prior to the time of the passage of the act. The State Dept. of Health may revoke a license when the operator is found incompetent or wilfully negligent in his duty. A penalty of \$10 is provided for each day on which there is a violation of the rules or regulation of the department. **FRANK BACHMANN**

Gans zeolite water softening patents upheld. **ANON.** *Eng. News-Record* 87, 168(1921).—The U. S. Circuit Court for the Western Dist. of N. Y. in a decision handed down on June 15th in the Permutit Co. against the Harvey Laundry Co. and the Re-finite Co. upheld the Gans patents for water softening by the use of zeolite. The defendants alleged lack of novelty, foreign publication, etc. The Court upheld the patent on the ground of infringement and decreed an injunction and an accounting with costs to the plaintiff. **FRANK BACHMANN**

Adsorption in sand filters. **JOHN DON.** *Engineering* 111, 759-60(1921).—In

small exptl. filters in which the sand had been thoroughly washed, rinsed with boiling water and heated for some time, adsorption of free and albuminoid NH_3 was demonstrated to proceed rapidly at first, and to become negligible after 12 to 21 hrs. A filter which had ceased to remove NH_3 , seeded with growths from an open sand filter and allowed to rest for a few days in moist condition, showed 92% reduction in the first 10 hourly samples thereafter. Also in *Kolloid-Z.* 29, 91-4(1921).

W. F. MONFORT

Treatment of waste waters from metallurgical plants. G. DELEESKAMP. *Wasser* 16, 213-6(1920); *Chimie & industrie* 5, 542(1921).—Review of processes used for the purification of various classes of waste waters from metallurgical plants. A. P.-C.

Boiler feed water purification. S. B. APPLEBAUM. *Chem. Met. Eng.* 25, 23-6 (1921).—This is an outline of the respective merits of various methods of boiler feed water treatment with special reference to the advantages of the zeolite water softening process. The use of boiler compds. is discouraged and the use of a boiler feed water free from hardness is advocated. The design of a water softening plant to produce a zero hardness water depends upon the compn. of the raw water. If the hardness is temporary in character and the amt. of water to be treated is fairly large the most economical type of treatment is a combination of lime-pptn. followed by zeolite softening. If the proportion of the temporary hardness is much below that of the permanent hardness straight zeolite treatment is to be preferred. Zeolite softening advantages are: simplicity, certainty of action, freedom from sludge disposal and chem. feeding and after reactions common to pptn. water softening plants.

G. C. BAKER

New boiler feed water system. ANON. *Blast Furnace and Steel Plant* 9, 392-4 (1921).—This is a description of the new boiler feed water system of the Oliver Iron and Steel Co.'s plant. The equipment comprises two 80,000 gal. reaction settling tanks, a small steel tank for mixing reagent solns., two special gravity filter units and a purified water basin. The hardness is reduced from 6.78 to 1.18 grains per gal.

G. C. BAKER

Interpretation of boiler-water analyses. J. R. McDERMET. *Chem. Age* (N. Y.) 29, 230-2(1921).—Mineral analysis of waters having a dissolved solid content of over 300 p.p.m. will indicate the dangers of its use for boiler water, while for a water of 60 p.p.m. or less a sanitary chem. analysis is a distinct contribution. Limits are given for the O-consuming capacity, nitrates, free and albuminoid ammonias, and chlorides. The dangers of corrosion due to dissolved O, org. acids, and CO_2 are emphasized. Brief theories of corrosion are given.

G. C. BAKER

Kestner's apparatus for removing dissolved gases from feed water. I. D. N. PERDRIZET. *Rev. gen. elec.* 9, 185-7; *Science Abstracts* 24B, 108-9(1921).—Dissolved gases and not the salts of feed water are the real causes of internal boiler-plate corrosion. K.'s app. consists of a closed circular vessel of sheet metal with concave top and bottom. In- and outlet pipes are provided for water to be purified and for water and steam for cleaning purposes. Cylinders contg. prepnd. Fe are 1.5 m. deep and occupy the central part of the vessel. The Fe is held in place by perforated top and bottom plates, somewhat cup-shaped. Above and below these cylinders and on a level with the inlet and exit pipes for the water, are baskets contg. flints. The flow of the water is reversed daily and the Fe(OH)_3 is flushed out frequently by steam and water.

W. H. BOYNTON

Multiscreen filter for removing oil from water. ANON. *Elec. Eng.* (Chicago) 79, 218 (1921).—A detailed account. The filtering elements are interchangeable cartridges or envelopes of heavy terry cloth mounted on individual wire-mesh rectangular frames.

C. G. F.

Colloidal chemistry and sewage. F. W. MOHLMAN AND LANGDON PEARSE. *Eng. News-Record* 87, 140(1921).—Colloidal chemistry can give: (1) a standard definition

of the limits of size of colloids in sewage; (2) a standard method for the detn. of sewage colloids; (3) effect of H-ion concn. on the removal of colloids; (4) tests of practical application of ppts. to sewage; (5) and principles governing the retention of moisture by sewage solids.

FRANK BACHMANN

Montclair, N. J., Commission acts on sewage and water. ANON. *Eng. News-Record* 87, 167-8 (1921).—The town Commission voted to contract with the Passaic Valley Sewerage Commission for the disposal of the sewage of Montclair through the Passaic Valley trunk sewer. Montclair had proposed heretofore to dispose of its sewage independently. The towns share of the expense of the sewage disposal project is estd. at over \$1,000,000. The Commission also voted \$700,000 to purchase the water distribution system from the Montclair Water Co.

FRANK BACHMANN

Seawage investigation. J. W. THOMSON. *New Jersey Sta. Rept.* 1919, pp. 445-7; *Expt. Sta. Record* 44, 321-2.—An outline is given of the proposed study of the chemistry and biology of sprinkling sewage filters and of the availability of the end products for fertilizers.

H. G.

Experiments on sewage purification. A. R. PADMANABHA IVER. *Cent. Provs. and Berar Dept. Agr. (India), Rept. Agr. Col., Nagpur. Bot. and Chem. Research, (etc.)* 1919, 21, 22; *Expt. Sta. Record* 44, 420.—Se. ... on expts. showed that dil. sewage can be applied to black cotton soil with greater advantage than concd. sewage, owing to the fact that more N is made available as nitrates with the former. This result is not as yet considered to be conclusive.

H. G.

Disposal of sewage in the tropics by means of septic tanks and soil purification. C. A. E. VAN LEEUWEN. *Meded. Rap., Dept. Burgerl. Openb. Werken Nederland, Indie, Afd. G.* 1919, III, 18; *Expt. Sta. Record* 43, 691.—Tropical practice in the disposal of sewage by small installations is described, and studies of soil and the action in septic tanks are reported. It was found that the cholera bacillus was killed after remaining three days in a septic tank, but that the typhoid bacillus was not. Experience with small septic tanks and sand and stone filters in Dutch East India is reviewed, and drawings of three sewage disposal systems to care for 15, 50, and 100 people are included, the design of which is based upon the disposal of about 25 l. (6.6 gal.) of sewage per capita per day.

H. G.

Sewage treatment plant for Calumet region of Chicago sanitary district. LANGDON PEARSE. *Eng. News-Record* 86, 986-8 (1921).—The treatment plant is to serve 150,000 people. It consists of 30 Imhoff tanks designed to permit ready conversion into aeration tanks; sludge drying beds; 2 activated sludge aeration tanks, one of which will treat settled sewage, and one the raw sewage; and a sprinkling filter with dosing tanks and secondary settling tanks. The Imhoff tanks are each 103' long by 34' wide with total depth of 26.4'. Capacity of each tank is 29,000 cu. ft. or a detention of 2.9 hr. with 1.77 million gal. per day flow. Sludge capacity is about 16,300 cu. ft. or 2.3 cu. ft. per capita. Sludge beds are designed on basis of 1 sq. ft. of bed area for 3 persons. The area of aeration tanks are the same as the Imhoff tanks with a water depth over filters plate of 14.4". The tanks are divided longitudinally by 2 baffles into 3 compartments. In treating 1.75 M. G. D. and 25% return sludge, the aerating period will be 4 hrs. A settling tank follows each aeration tank. They are 34' square at the top warping to a circular bottom from a depth of 5.4" below water surface. Each tank is provided with a Dorr mechanism which plows the sludge to the center of the tank. The sludge passes through an 8" pipe under the floor to an air lift. Settling rate figures 1550 gal. per sq. ft. settling area. The filter will treat 1.75 M. G. D. The effluent from the filter is settled in 2 Dortmund tanks 30' in diam. with a detention of 1.5 hr.

FRANK BACHMANN

The bacterial purification of trade wastes. G. McGOWAN. *J. Soc. Chem. Ind.* 40,

148-50T(1921).—The bacterial treatment of domestic sewage is fairly well systematized, the vol. to be treated on unit of filter depending on the strength of the sewage or tank liquor. The "strength" is measured in terms of O required completely to oxidize the org. matter and N present. The ratio of the figure for dissolved O absorption in 5 days at 18° to that for complete oxidation of domestic sewage is 1:3; or domestic sewage takes up 33 parts per 100,000 by wt. of dissolved O from water in 5 days at 18°. The figures for other wastes are as follows: grain and malt distilleries 33, malting and breweries 33, calico printing and dyeing 25, paper mills 22, and tanneries 22. Or a unit section of a bacterial filter will purify 1 vol. of "standard" domestic sewage, or 1 vol. of waste distillery liquor, or 25/33 vol. of waste liquor from calico printing and dyeing, all liquors being assumed as diluted to the same strength as the sewage.

M. C. PERRY

Lights and shadows of the activated sludge process for the treatment of sewage and industrial wastes. HARRISON P. EDNY. *J. West. Soc. Eng.* 26, 259-72(1921).—The advantages of the process include its high efficiency as a process of sewage purification. When high purity is desired it is possible to obtain an effluent with but little suspended matter, with but few bacteria, and little, if any, color and odor. The process can be so regulated that partial purification can be obtained, when complete purification is not necessary. An important feature is the amt. of air required. This depends on the compn. of sewage to be treated, quality of effluent desired, period of aeration, proportion of sludge to be returned with the sewage, and the temp. of aeration. The amt. of air required, depending on these conditions, varies from 1.0 cu. ft. to 6.0 cu. ft. per gal. In some cases reactivation of the sludge may be advantageous. Preparatory treatment by fine screening is desirable when heavy settling solids are present. The complete removal of the sludge is a great advantage of the process, but its final disposal presents difficulties. Disposal in pools has been satisfactory at Houston, Texas. Plate presses, a squeeze press (Worthington or Berrigan) and centrifugal machines have been tried with some degree of success. Acidifying the sludge increases the capacity, but it is questionable yet whether the cost is warranted. More investigation is suggested of methods for the aeration and agitation of the sewage, and the dewatering of the sludge.

EDWARD BARTOW

Sanitary survey of Lake Erie opposite Cleveland, Ohio. J. W. ELLMS. *Eng. News-Record* 86, 1039(1921).—Suitable water was 4 to 5 miles from shore; better water is obtainable nearer the shore west of the mouth of the Cuyahoga River than east of it. Wide fluctuations in quality were noted due to effect of wind and storm currents carrying sewage-laden shore water out into the lake.

FRANK BACHMANN

Fumigation with formaldehyde—a substitute for the permanganate-formalin method. DAVID WILBUR HORN. *Proc. Delaware County (Pa.) Inst. Sci.* 9, 1-55 (1920).—When crystals of $KMnO_4$ and formalin are mixed to evolve $HCHO$, the heat effect is greatest with crystals of moderate fineness and least with those which are very coarse or very fine. To insure reaction, at least 27% of the $KMnO_4$ should pass a No. 100 sieve. Formalin acidified with H_2SO_4 , with or without the addition of glycerol, undergoes partial polymerization with ptn. of the solid polymer of $HCHO$. When the $KMnO_4$ -formalin method is used, 500 cc. of formalin being added to 250 g. of $KMnO_4$ for each 1000 cu. ft. of space to be fumigated, 37.5% of the total $HCHO$ (or 75 g. of that compd.) is evolved. To obtain this wt. of $HCHO$ gas by the bleaching powder-formalin method, 800 cc. of formalin must be added to 620 g. of bleaching powder, for only 23.0% of the total $HCHO$ is evolved. To obtain this wt. of $HCHO$ gas by the $Na_2Cr_2O_7$ -formalin method requires approx. 3 times the amts. of reagents usually taken which are: $Na_2Cr_2O_7$ 10 oz. avoirdupois, formalin 1 pint, com. H_2SO_4 1.5 fluid oz.; for only 13.9% of the total $HCHO$ is evolved. By using bleaching powder and formalin in

the ratio given, liberation of Cl compds. is negligible; the reaction becomes extremely violent if 5 cc. of formalin be added to 5 g. of bleaching powder; and if the proportion of bleach to formalin be further increased, notable quantities of Cl compds. are liberated. The conclusion is drawn that, at present, the least expensive method for terminal fumigations is the bleaching powder-formalin method; for the same yield of HCHO gas, this method costs approx. one-sixth as much as the standard KMnO₄-formalin method, and approx. one-third as much as the Na₂Cr₂O₇-formalin method. In practice, the bleaching powder is placed in a bucket, and the formalin is poured upon it. J. S. H.

Action of water on lead (THRESH) 9. The filtration of water in paper mills (L'HOMME, ARGY) 23. Salinity of some Swedish ground waters (RICHERT) 8. The Sly dust arrester for filtering purposes (ANON.) 1.

FISCHER, FERD.: Das Wasser, seine Gewinnung. Verwendung und Beseitigung. Leipzig-Rennhitz: Otto Spamer.

FLÜGGE, CARL: Grundriss der Hygiene. Berlin and Leipzig: Verlager Walter de Gruyter and Co. For review see *Z. öffentl. Chem.* 27, 166 (1921).

HERING, RUDOLPH, AND GREELEY, SAMUEL: Collection and Disposal of Municipal Refuse. New York: McGraw-Hill Book Co. 653 pp. \$7.00.

NOTTER, J. LANE AND FIRTH, ROBERT HAMMILL.: Hygiene. 9th ed. New York: Longmans, Green. 540 pp. \$3.25.

Distilling water. B. A. DE WOERN. U. S. 1,379,502, May 24. The heat in H₂O from the cooling jackets of internal combustion engines is utilized to effect distn. of a portion of the H₂O by passing it through a scrubbing tower against a counter-current of air.

Flotation and sedimentation apparatus for treating sewage. W. C. FERGUSON. U. S. 1,380,200, May 31.

Regenerating vitiated air. H. P. SCOTT and W. G. BOND. U. S. 1,379,221, May 24. Air contg. an undue amt. of CO₂ is passed through a body of H₂O contg. sep. masses of BaO₂ and PbO₂ or similarly acting compds. in order to restore the normal O content of the air by chem. reactions.

15—SOILS, FERTILIZERS AND AGRICULTURAL POISONS

J. J. SKINNER AND ALBERT R. MERZ.

The agricultural soils of the Union of South Africa. C. F. JURITZ. *S. Africa J. Industries* 4, 76-84 (1921).—The grain soils of southwest Cape Province are grouped as follows: Sandstone, Malmesbury, and Bokkeveld soils. The Sandstone and Malmesbury soils are deficient in plant food and humus and are quite often acid. Bokkeveld soils are much richer in plant food. The soils from each region are described geologically and their origins are given. Considerable variety of soils exists in Cape Province. The gray and reddish loams of the Great Karroo cover the largest portion of the country. The coastal belt in the southwest comprises gravelly clays of a drab color. On the South Coast the soils contain more humus and are frequently acid. Alkali soils occur in some parts, which result from bad drainage. In a discussion of the Orange Free State soils it is pointed out that Na₂CO₃ was almost absent from the lighter soils but present in the low-lying places. J. J. SKINNER

Agricultural study of the soils of Cochin China. P. Bussy. *Bull. Agr. Inst. Sci. Saigon, Cochin* 2, No. 1, 1-11 (1920); *Expt. Sta. Record* 42, 718-7.—The geology, origin and analyses of the soil of Cochin, China are given and discussed. J. J. S.

Parallelism of the soils developed on the gray drifts of Minnesota. CLAXTON ORD ROST. Univ. of Minnesota. *Diss. Thesis Univ. Minn.* 1918, 68 pp.—The great majority of Minn. soils are glacial in origin. R.'s object is to det. what relation, if any, exists between the character of the soils upon the various glaciations and the age of the latter. A general discussion is given of the soil types occurring in the region which is of interest primarily from a geological point of view. C. B. DURGIN

Disinfection in soil. E. MIÈGE. *Prog. agr. vitic.* 41, 133-40(1920); *Expt. Sta. Record* 42, 717-8.—The effect of S, CuSO₄, KMnO₄, CS₂, calcium hypochlorite, charcoal, toluene, lysol and H₂O₂ was tested in the field growing potatoes, buckwheat, tomatoes, carrots and beans. The effect of these materials was marked, S, CuSO₄ and toluene gave best results. In garden expts. all the materials increased yields. Beans were increased 120% by the use of calcium hypochlorite. Greenhouse tests with vegetables showed beneficial effect from the use of soil disinfections. A review is given. J. J. S.

Control of root-knot. II. J. R. WATSON. Florida Agr. Expt. Sta., *Bull. No. 159*, 32-44(1921)—“Cyanamid,” which contains about 45% CaCN₂, 47% Ca(OH)₂, 13% C, 4% CaCO₃ and 2% CaSO₄, is used to rid soil of nematodes. It is applied at the rate of 1 ton per acre and the soil irrigated. It should be applied 6 to 8 weeks before seeds are planted. Na cyanamide with (NH₄)₂SO₄ is used and 600 and 900 lbs., resp., are used per acre. This is applied in a water soln. No satisfactory chemical has been found for treating soils when trees are grown, as injury to vegetation is produced. J. J. S.

The influence of fertilizing and plant growth on the precipitation curve of water-soil mixtures. C. VON SEELHORST, W. GEILMANN, AND H. HUBENTHAL. *J. Landw.* 69, 5-32(1921).—The analysis by elutriation was conducted according to the method of Wiegner. In estg. cond. the Kohlrausch-Holbürn method was used. From various exptl. plots the authors have collected data on the solv. of the salts in the soil as affected by fertilization and by the plant grown; the cond. of these salt solns. is also given. The various plots were fertilized with K; N; P; K, N, P; K, N; K; P; N, P and a control was used. The quantity of suspended particles varies inversely as the salt content. F. M. SCHERTZ

Sulfur as a fertilizer. VERMOREL. *Compt. rend. agr. France* 7, 492-3(1921).—Increased yields, healthier plants, greater resistance to drying, lessening or the disappearance of certain diseases and rendering food materials more accessible are benefits of S fertilization. F. M. SCHERTZ

Research on nitrogenous fertilizers. HANS WIESSMANN. *Umschau* 25, 268-71 (1921).—A practical discussion of the use of nitrogenous fertilizers. Expts. using NaNO₃ show that yields were greatly increased. F. M. SCHERTZ

Vegetable experiments with new nitrogenous fertilizers. SCHOLZ. *Z. Landw. Kammer. Braunschweig.* 88, 435-7; *Expt. Sta. Record* 43, 221.—Expts. in pots were made to det. the relative values of a number of N salts. Oats were grown. NaNO₃ gave the best results. NH₄Cl gave as large grain yield as did (NH₄)₂SO₄. Yields obtained with Na and K ammonium nitrate were smaller, but each produced increased growth. J. J. SKINNER

Influence of the nitrogen, in liquid manure conserved by means of formalin, upon plant production. E. BLANCK AND F. PREISS. *J. Landw.* 69, 33-48(1921).—The hexamethylenetetramine present acts favorably upon plant production. The condensation product aldehyde-urea did not give favorable results. For best results formalin should not be added to liquid manure until all of the urea has been converted to NH₃. F. M. SCHERTZ

A bacteriological analysis and cultural test of “nitro-bacter soil vaccine.” DAN. H. JONES. Guelph Coll. *Sci. Agr.* 1, 266-7(1921).—This prepn. was found by cul-

tural and bacteriol. tests to be of little or no value for increasing the denitrifying, ammonifying, nitrifying and N-fixing bacterial content of the soil. W. H. Ross

Determination of borax in fertilizers and crude stock. C. H. JONES AND G. F. ANDERSON. Vermont Agr. Expt. Sta. *Am. Fertilizer* 52, No. 8, 57-9 (1921).—A description is given of a modification of the Ross and Deemer method (*C. A.* 14, 2233) for detg. borax in fertilizers and fertilizer materials. W. H. Ross

The new fertilizer: urea; a substitute made without sulfuric acid. E. C. JUL. MOHR. *Ind. Mercuur*, May 6, 1921; *Arch. Suikerind.* 29, 890-2 (1921).—The manuf. of $(\text{NH}_4)_2\text{SO}_4$ in Java is too expensive, because the S must be imported, local sources being inadequate. There are good prospects, however, for the manuf. of urea as a coke oven by-product. For this reason it is advisable at once to start field tests with this fertilizer. F. W. ZERBAN

Determination of urea in fertilizers. ERLING B. JOHNSON. *J. Soc. Chem. Ind.* 40, 126T (1921); *J. Ind. Eng. Chem.* 13, 533-5 (1921).—The method depends on the fact that urea gives a difficultly sol. salt with oxalic acid. By selecting the proper conditions the solv. can be made so slight that a quant. detn. can be made, 2 to 5 g. of the urea-contg. sample are dried and shaken out with 100 cc. of amyl alc. 25 to 50 cc. of the filtrate are mixed with the same volume of Et_2O and the urea is pptd. as oxalate with 25 cc. of a 10 per cent soln. of anhydrous oxalic acid in amyl alc. The ppt. is stirred and allowed to stand in cold H_2O $\frac{1}{2}$ hr. Filter the mixture through a gooch crucible and wash by filling one time totally and one time half with a mixture of half amyl alc. and half Et_2O and then with Et_2O alone. Dry the ppt. in a vacuum desiccator and weigh. The ppt., $(\text{COOH})_2\text{CO}(\text{NH}_2)_2$, contains 26.67% N and 57.01% urea. When urea is present as a salt or in complexes such as $\text{Ca}(\text{NO}_3)_2\text{4CO}(\text{NH}_2)_2$ the urea does not go into soln. without Ca with amyl alc. but must first be set free. The sample and reagents should be as nearly anhydrous as possible. RUSSELL M. JONES

Direct method for the determination of dicyanodiamide. ERLING B. JOHNSON. *J. Soc. Chem. Ind.* 40, 125-6T (1921); *J. Ind. Eng. Chem.* 13, 533-5 (1921).—By the use of weak solns., a low temp. and an excess of picric acid J. finds that the compd. of silver picrate with 2 mols. of dicyanodiamide was so insol. and changed so slowly into the mono-compd. that a volumetric method could be based on the detn. of the amt. of standard Ag soln. used to effect the pptn. When the sample contains 5-15% dicyanodiamide N, take 5 g., or more if less N is present. Transfer the sample to a 500-cc. flask and add 450 cc. cold H_2O . If the sample contains Ca, add glacial AcOH until all the Ca is in soln. This also facilitates the soln. of the nitrogenous compds. Stronger mineral acids isomerize N compds. Shake the flask in a machine for 3 hrs., make up to 500 cc. and filter. To 100 cc. of the filtrate add 5 cc. of 20% HNO_3 and then 20 cc. of sodium picrate soln. heated to 40° . 7.5 g. of picric acid neutralized with NaOH and dild. to 100 cc. and cool the soln. to about 5° . Titrate with $N/22.4$ AgNO_3 soln., drop by drop with const. shaking. Add 2 cc. of Ag soln. in excess. Shake vigorously and allow ppt. to settle 15 min. at 5° . Shake 2 or 3 times, dil. to 200 cc. with cold H_2O and filter. Est. the excess Ag soln. used by titration with $N/22.4$ NaCNS in 100 cc. of the filtrate after adding 5 cc. of 20% HNO_3 and 2 cc. of 5% $\text{Fe}_2(\text{SO}_4)_3$ as indicator. On a 5 g. sample every cc. of Ag soln. used corresponds to 1% N as dicyanodiamide. To obtain good results some correction must be applied. Each observer should work them out for himself. When chlorides and sol. sulphides are present a blank test should be made by titrating the Ag soln. without the addition of picric acid. The formation of dicyanodiamide silver complexes is not limited to picric acid. The reaction is typical of all n'trophenols which are sol. in H_2O . RUSSELL M. JONES

Boron in relation to the fertilizer industry. J. E. BRECKENRIDGE. *J. Ind. Eng. Chem.* 13, 324-5 (1921).—From pot expts., corn and beans showed borax poisoning

with 6 lbs. B per acre and 10 lbs. was decidedly harmful. Eight to 10 lbs. caused injury to potatoes. Methods for detg. borax in fertilizers are discussed.

J. J. SKINNER

Raw phosphate of Estland (Estonia) and its action on different plants. M. WRANGELL. *Landw. Vers. Sta.* 96, 1-44(1920); *Expt. Sta. Record* 44, 421(1921).—Expts. on the fertilizing value of so-called obolus sandstone, which contains obolus-shaped formations of raw phosphate, are reported. This raw phosphate contains about 35% of P_2O_5 and about 52% of CaO. Cropping expts. with different crops to compare this phosphate with other P_2O_5 -bearing materials showed that plants vary considerably in their ability to assimilate the P_2O_5 of difficultly sol. phosphates. In this respect they are sepd. into 2 groups—those which can thrive on raw phosphates and those which require sol. phosphates for yield. It was further found that the assimilation of raw phosphate can be aided by the use of physiologically acid supplemental fertilizers. Individual raw phosphates varied considerably in their availability to plants. Cryst. fluorapatite was inactive, while apatite, taaffeite, phosphorite, and the Estonian obolus sandstone were generally well utilized by plants, particularly the last, which gave as good results as Thomas meal. It is concluded that the use of raw phosphates, by properly choosing crops, is of practical importance.

F. M. SCHERTZ

Lime treatment. The effect and use of lime in cultivation. HANS GLÖMME. *Supplement to "Tids. Norske Landbruk"* 1, (1921); reprint No. 10, 104 pp. (1921).—Clay soils and sandy soils respond well to all Ca treatments. Black soils gave little response. Light clay responded better than blue clay. Fine sandy soils with clay subsoil gave excellent results upon liming but results were even better when clay was used. No great effect was however noted the first two years. Expts. showed that the finer the state of division of the $CaCO_3$ added the greater its effect. The question of Ca treatment with regard to specific types of soils of Norway is discussed.

G. E. HOLM

The fertilizer action of carbon dioxide. ALFRED GEHRING. *Fühling's Landw. Ztg.* 70, 137-53, 181-97(1921).—The fertilizer action of CO_2 when used in connection with various org. fertilizers is reported. It exerted a favorable influence as shown by increased growth of the plants.

F. M. SCHERTZ

Agricultural insecticides. I. II. Raw materials and methods of manufacture. R. R. HENDERSON. *Chem. Age* (N. Y.) 29, 205-7, 257-60(1921); cf. *C. A.* 15, 2687.—A review of the raw materials and methods of manuf. of the most commonly used insecticides. As a substitute for dry lime sulfur, Na_2S has been used. BaS and zinc arsenite have been proposed and have been manufactured on a small scale. R. M. J.

Effects of nicotine sulfate as an ovicide and larvicide on the codling moth and three other insects. N. E. MCINDOO, F. L. SIMANTON, H. K. PLANK AND R. J. FISKE. Bur. of Entomology. U. S. Dept. Agr., *Bull.* No. 938, 1-19(1921).—A 1:800 spray soln. of nicotine sulfate kills about 99% of the freshly laid eggs of the silkworm moth and about 75% of the older eggs, but it is inefficient against the eggs and larvae of the codling moth, tussock moth and potato beetle. When mixed with soap the nicotine sulfate soln. was sometimes found to give a fair degree of control of the codling moth in field expts., but it was not as effective as 1 lb. of powdered $Pb_3(AsO_4)_2$ in 50 gals. of water, and there is no advantage in combining the 2 poisons in sprays for the control of this insect.

W. H. ROSS

Bordeaux-oil emulsions. J. R. WINSTON AND W. W. YOTHERS. *Fla. Grower* 21, 9(1920).—Any diln. of the various oil emulsions combined readily with any strength of Bordeaux mixt. likely to be used and showed no detrimental effects upon either of the constituents. Bordeaux-oil emulsions settled less rapidly and spread more evenly than plain Bordeaux. The results to date with Bordeaux-oil emulsion mixts. indicate that it will prove very effective in the control of certain fungus diseases of citrus and that its

use is not followed by injury to the tree or fruit or by abnormal increase of scale insects. R. M. J.

Natural indigo (ATKINS) 25. Sewage investigation (THOMSON) 14. Nitrogen products (HARKER) 18.

FRAPS, G. S.: *Principles of Agricultural Chemistry*. Easton, Pa.: The Chemical Pub. Co. 501 pp. \$5.00 net.

HONCAMP, F.: *Die Stickstoffdünger*. Berlin: Paul Parey. For review see *Chem. Tech. Ztg.* 39, 28(1921).

16—THE FERMENTATION INDUSTRIES

H. S. PAYNE

Contribution to the natural history of alcoholic fermentation. I. The universal occurrence of yeast and alcohol in nature. P. LINDNER. *Wochschr. Brau.* 37, 1-10 (1920). JOSEPH S. HEPBURN

Probable cause of the lack of harmony in the results of assimilation experiments with different yeasts and with different sugars. P. LINDNER. *Wochschr. Brau.* 37, 19-21(1920). JOSEPH S. HEPBURN

Enzyme research and yeast fermentation. G. WOLFF. *Wochschr. Brau.* 37, 27-9, 38-40, 46-8(1920). JOSEPH S. HEPBURN

Wines from hybrid vines. L. ROOS. *Ann. fals.* 13, 85-8(1920).—Attempts are being made to introduce as far as possible hybrid vines that are resistant to mildew; but most of them do not give wine of satisfactory qualities. Analyses and results of gustatory tests are given. A. P.-C.

Free tartaric acid in 1920 wines. FONZES-DIACON. Univ. of Montpellier. *Ann. fals.* 14, 84-6(1921).—F.-D. found one wine having 12.8% EtOH (by vol.), 8.9 g. total acidity per l., 3.6 g. free tartaric acid, and 4.8 g. cream of tartar. This is exceptional; but many cases have been observed where the free tartaric acid was 1.5 g. per l. This is ascribed to the exceptionally dry season which prevented as complete an assimilation of the K₂O of the soil as in normal seasons. This resulted in less complete neutralization of the tartaric acid of the green grapes. A. P.-C.

The use of hydrogen peroxide in wine making. L. FERRÉ. *Ann. fals.* 13, 473-7 (1920).—Ravaz (*Prog. agr. vit.*, Sept. 15, 1918; Sept. 14, 1919) recommends the use of H₂O₂ (1 l. of 10 vol. H₂O₂ per hl. of wine) for "defoxt" wines, claiming that it removes all "foxed" or moldy taste, that it does not introduce any substances not already present in the wine, and that it completely disappears from the wine. F. finds that the complete elimination of the H₂O₂ requires 2-7 days, while if the wine is pasteurized, thereby destroying the diastases, appreciable amounts remained after 3 weeks. The tests for the presence of H₂O₂ consist in adding 5 cc. of 10% KI and 10 cc. of starch paste to 25 cc. of the wine. In the case of red wines, which might mask the blue color, the liberated I is extd. with C₆H₆. The sensitiveness is about 1 part of 12 vol. H₂O₂ in 12,000 parts of wine. The "foxed" taste is removed, but it is replaced by a characteristic "oxidized" taste which is no better. A. P.-C. *

The use of oxygen in wine making. PH. MALVEZIN. *Ann. fals.* 13, 605-6(1920); (cf. preceding abstract, also *C. A.* 15, 726).—M. agrees with Piedallu and Ferré that H₂O₂ should not be used for the treatment of wine, and suggests that O (obtained from liquid air) be used instead. Not only does it overcome "blueing" ("casse ferrique") of the wine by oxidizing Fe" to Fe" which combines with the tannins and is eliminated but when properly applied it kills off both aerobic and anaerobic enzymes, and it ppt. a considerable amt. of cream of tartar. A. P.-C.

Ebulliometric apparatus for determination of alcohol in wines. U. PRATOLONGO. *Giorn. chim. ind. applicata* 3, 248-52(1921); cf. *C. A.* 15, 3177.—Ebulliometric detns. of alc. in wines are subject to 3 series of errors. (1) The first series is bound to those influences which the constituents of wine other than alc. and H₂O bring to bear upon the b. p. of the wine. (2) A second series of errors is derived from the use of the movable scale for correcting the influence of the atm. pressure upon the ebulliometric data. The soln. of this series of errors implies 2 kinds of errors present in this series: (a) the discontinuities of the graduation, depending upon the imperfect calibration of the capillary thermometer, become sources of error when, with the transposition of the movable graduation, the correspondence ceases between the discontinuities of the scale and the variations of section of the capillary thermometer. (b) The supposition that a single graduation suffices for all pressures does not appear to be true to fact. The use of the movable scale for this class of errors brings about a systematic error which can be as much as a few tenths of a degree, when the variations of pressure from an initial point is equal to or greater than 20 mm., owing either to variation of pressure of the atm. itself, or because simultaneous analyses are carried on at points which have different barometric pressures because they are at different heights from the sea-level. (3) This series of errors is related to the method of employing ebulliometric app., on the one hand, because of variations of the power of the source of heating, and on the other hand, because of unnoticed variations of atm. pressure during 1 or more ebulliometric detns. in series. For example, a wine boiled by an elec. power of 36 watts (60 v. \times 0.6 amp.) gave a b. p. of 90.40°, answering to an apparent content in alc. of 15.00%. The same wine heated by an elec. power of 240 watts (160 v. \times 1.5 amp.) gave a b. p. of 90.80°, answering to an apparent alc. content of 14.45%. Sources of error also reside in the indiscriminate use of alc. lamps, gas, etc., as a source of heat power.

ROBERT S. POSMONTIER

Acquired tolerance of beer yeast for arsenic (EFFFRONT) 11C.

Media for yeast propagation. R. WAHL. U. S. 1,379,294, May 24. A mash contg. malt 100 lbs. to 60 gals. H₂O is heated to 45-55° and there is added to it 10 lbs. of a bacterial lactic acid liquor contg. 1% of lactic acid. Two hrs. at the temp. stated is allowed for peptonization and the temp. is then raised to 62-5° for diastatic conversion which may be allowed to proceed for 3-4 hrs. After saccharification, the material may be again inoculated with lactic acid bacteria and maintained for 12-15 hrs. at a temp. of 52-54° to allow an increase in lactic acid to a total free acid of 0.4-0.5%. The material is then heated to 70° to check further lactic acid formation. A liquor high in phosphates and amino compds. is thus obtained. Other cereals or oil-bearing seed meals may be used with the malt in prep. a yeast nutrient.

17—**PHARMACEUTICAL CHEMISTRY**

W. O. EMERY

Identification and quantitative determination of veronal. L. VAN ITALLIE AND A. J. STEENHAUER. *Pharm. Weekblad* 58, 1062-8(1921); cf. *C. A.* 15, 2898.—The detn. of veronal in urine and organ exts. by previously described methods gives at best a recovery of 90%. The loss is due to incompleteness of the ether extn., and to adsorption by the decolorizing charcoal. These errors are eliminated by extg. with Et-OAc, in which veronal is more than twice as sol. as in ether, and by purifying the crude product with KMnO₄ in acid soln. The method applied to urine is as follows: 100 cc. urine are treated with 10 cc. neutral or basic Pb(OAc)₂ and filtered. The filtrate is

evapd. on a water bath to 25 cc. and slightly acidified with AcOH. The warm soln. is transferred to a separatory funnel and shaken twice with 2 vols. EtOAc. The latter is filtered through a dry filter, evapd., and the residue dissolved in 10 cc. boiling H₂O. 5 cc. dil. H₂SO₄ are added, the soln. is heated to boiling and 0.1*N* KMnO₄ added until the supernatant liquid is colorless. An excess of KMnO₄ is destroyed by adding a few drops of H₂O₂. The colorless soln. is then shaken twice with 2 vols. EtOAc, the latter filtered through a dry filter, evapd., and the residue dried at 100° and weighed. Starting with known amts. of veronal the yield was 100% of a white product with the correct m. p.

A. W. Dox

Monographs on floral odors. III. Orange blossom odor. P. P. R. *Perf. Essent. Oil Rec.* 12, 139-42(1921); cf. *C. A.* 15, 1962, 2150.—After a general discussion of the orange flower with respect to its importance in the perfume industry, as also the several volatile products obtained by distn., maceration, enflleurage or solvents, the author reviews the properties and constituents of the natural and synthetic oils of neroli, and presents formulas for odors and compositions of flower oils of the orange blossom type. **IV. Lily type of odor.** *Ibid* 170-5.—The paper presents a botanical sketch of the principal *Lilium* species involved in the industry, and in particular working formulas for the prepn. of the basic and flower oils entering into the manuf. of lily perfumes and odors of the lily type, notably those of tulip, lily of the valley or muguet, magnolia, ylang-ylang, and others.

W. O. E.

Recovery of essential oils from distillation waters. J. DE LORGUES. *Perf. Essent. Oil Rec.* 12, 143(1921).—Precise details are given for the recovery of oils heretofore lost in the distn. waters, notably of lavender and rose oils, as produced in France and Bulgaria.

W. O. E.

Essential oils with special reference to those obtained from the eucalyptus. F. J. TROMP. *S. African J. Industries* 4, 85-9(1921).—A general description of the subject, including extn. methods, compn. and application. T. calls attention to the fact that the eucalyptus are remarkable in that the quality and nature of the oil obtained from a given species are const. and practically independent of the climate or locality where grown. Expts. are at present under way to det. whether this also holds true in the case of eucalyptus grown in Africa.

W. O. E.

Isopropyl alcohol. K. LÖRFL. Berlin-Wilmersdorf. *Seifensieder-Ztg.* 48, 542-3 (1921).—A summary of the properties of propyl and isopropyl alcs. as found in the literature. Since only a few expts. were found recorded regarding the physiol. action of isopropyl alc. (to the effect that its action is very similar to that of EtOH), L. took doses of 4, 8, 8 and 15 cc. of isopropyl alc. in the form of a cordial in 4 successive days without any other consequences than the temporary effect that similar quantities of EtOH would produce. Its use as a medium for cosmetic prepns. and its use in mouth-washes are entirely harmless.

P. ESCHER

Tar products in the chemico-pharmaceutical industry. G. WOLFF. *Seifensieder-Ztg.* 48, 543-4, 592-4(1921).—A summary of the uses of the more common coal-tar products as disinfectants and antisepsics, describing the use of ichthylol, thiol, naphthalene, phenol, cresols, lysol, thymol, resorcinol, pyrogallol, naphthol, guaiacol, anthracene, chrysarobin, benzoic, cinnamic and salicylic acids and aspirin. P. ESCHER

The determination of the hydroxymethylanthraquinone compounds in the drugs which contain them. E. MAURIN. *Bull. sci. pharmacol.* 28, 373-6(1921).—One g. of substance as a fine powder is digested on a water bath for 2 hrs. under a reflux condenser with 25 cc. of 20% H₂SO₄ and 100 cc. CHCl₃. On cooling the hydroxymethylanthraquinones are found dissolved in the CHCl₃ which is sepd. from the aq. acid by decantation. The latter is washed with 20 cc. CHCl₃ which is then added to the original solvent. The CHCl₃ is distd. off until but 10 to 12 cc. remain. This is extd.

first with 100 cc. of 5% KOH and then with 50 cc. lots until no coloration is obtained. The alk. wash liquors are combined and made to 1 l. and the anthraquinone content is detd. by colorimetric comparison with a standard of 0.01 g. emodin in a 1. of 5% KOH.

F. S. HAMMETT

Detection of gum arabic in powdered gum tragacanth. L. THÉVENON. Institut Pasteur. *Ann. fals.* 13, 489(1920).—Twenty cc. of gum soln. are placed in a Nessler tube, an equal vol. of pyramidone reagent (pyramidone 2 g., H₂O 50 cc.) is added, and then a few drops of 12 vol. H₂O₂. The soln. is shaken vigorously, and in 5-30 min. there develops a violet-blue coloration, which is best seen against a white background. The test will detect an addition of 5% of gum arabic.

A. P.-C

The microscopic analysis of tobacco. L. PALMANS. *Ann. Gembloux* 459-67(Oct. 1920); *Ann. fals.* 13, 620(1920).—Chem. analysis is not satisfactory for detecting adulteration of tobacco. The usual detns. are those of nicotine and of a little-known camphor "nicotiane." The nicotine content varies within such wide limits that the detn. is of little or no value for detecting adulteration. By allowing to stand for 24 hrs. in distd. H₂O, mounting with 10% KOH, and carefully crushing, microscopical examn. will show the sinuous epidermic cells of the limb, the elongated epidermic cells of the nerves, and especially the multicellular hairs with enlarged heads. These characteristics are not present in the leaves generally used as adulterants (cherry, rhubarb, horse-chestnut). Similar hairs are to be found in belladonna, *Datura stramonium*, and henbane; but these leaves are more expensive than tobacco and can be differentiated from it. Other Solanaceae, potatoes, tomatoes, sweet and bitter nightshades, and winter cherry have no hairs. P. gives 13 diagrams, and advises the detn. of nicotine by Kissling's method as confirmatory data.

A. P.-C.

Manna and extraction of mannitol. G. SCARLATA. *Giorn. chim. ind. applicata* 3, 254-5(1921).—A description is given of the source and method of collection of manna, and the different com. grades. The following method was devized for the extrn. of mannitol from manna. The manna (2-3 cwt.) was distributed in a large wooden vessel, uniformly moistened with about 15% of water, and subjected to strong pressure after 24 hrs. The expressed liquid, a reddish thick syrup with a green fluorescence, constituted the manna molasses of commerce. The pressed cakes were dissolved in the hot with the smallest possible amt. of water and acidulated with oxalic acid to ppt. the colloidal clay. The leaves, bark, etc., were sepd. by a skimming ladle, and the residual liquid allowed to cool in a large wooden crystg. vat. Two layers formed, the upper constituted of crystd. mannitol, and the lower of all the earthy part. The upper layer was sepd., centrifugalized, dissolved in hot water and defecated by addition of alum and lime. The soln. was filtered through an ordinary felt filter, concd. and cooled. The crystals of mannitol sepg. were very pure and almost colorless. To prep. mannitol cones, S. proceeded thus: The mannitol crystals were dissolved in water, animal black was added, the whole filtered, and the colorless filtrate neutralized exactly by dil. H₂SO₄. The liquid was slowly heated while in motion, to avoid formation of large crystals, and when it became very turbid and offered considerable resistance to agitation (the temp. not over 40°), it was quickly ladled into tinned Cu cones of 1200 cc. capacity, each 1200 cc. of liquid contg. about 300 g. mannitol. After complete cooling, the mother liquor was expelled by means of a special centrifuge, and the mannitol cones were dried in the oven.

ROBERT S. POSMONTIER

Essential oil of Hamago. YEINOSUKE SHINOZAKI. *J. Chem. Ind. Japan* 24, 191-202(1921).—Chem. analysis of the essential oil of Hamago, *Vitis trifolia* L., is given. Dry twigs gave 0.11-0.12% and dry leaves 0.28% of the oil. Four samples were used: (1) the oil obtained from Ogasawara Islands in 1914, (2) oil prep'd. in 1918 from plants obtained from the Islands, (3) oil prep'd. in 1919, and (4) oil prep'd. from the

plant obtained from Kanagawa. The respective characteristics of these samples are as follows: d_{4}° 0.8908, 0.8950, 0.9141, 0.9200; n_{D}^{20} 1.4707, 1.4774, 1.5010, 1.8880; $[\alpha]_D^{20}$ -39.6, -47.20, -45.6, —; acid no 0, 1.75, 0, 0; sapon. no. 23.38, 38.70, 30.34, 55.05; sapon. no. after acetylation 40.14, 44.47, 53.34, —. From fractional distn., S. identified levulo- α -pinene and camphene (55%), terpinyl acetate (10%) and diterpene alc. (20%).

S. T.

Essential oil of Shimamuro. YEINOUSKE SHINOZAKI. *J. Chem. Ind. Japan* 24, 202-8 (1921).—Chem. analysis of the oil of Shimamuro or Hidé, *Juniperus taxifolia*, HK and Ar., found in Ogasawara Islands. On distn. of the leaves and twigs of the plant, about 0.24% of light green oil was obtained. Two samples were used: (1) oil prep'd. in the Islands and (2) oil prep'd. by S. from the plant obtained from the Islands. Their consts. are d_{4}° 0.8675, 0.8701; n_{D}^{20} 1.4702, 1.4718; $[\alpha]_D^{20}$ —, -29.9; acid no. 0.94, 0; sapon. no. 11.69, 10.37; sapon. no. after acetylation 19.60, 18.89. The chief constituent of this oil is α -pinene (the nitropiperidine compd. m. 117°).

S. T.

Relation between the content in essence and the yield in oil of cade from the wood of *Juniperus oxycedrus*. R. HUERRE. *J. pharm. chim.* 23, 441-9 (1921); cf. *C. A.* 13, 1369.—Dry distn. expts. without and with addition of essence to wood previously exhausted of its essence and resins show that in the formation of oil of cade, the essence distills entirely as such; it also dissolves the heavy tars which in its absence would not enter into the compn. of the oil. In the dry distn. *l*-cadinene is destroyed or altered only to the extent of 20 to 25% of the amt. contained in the essence. S. WALDBOTT

Iodinol. ANON. *J. Am. Med. Assoc.* 77, 637 (1921).—Iodinol is claimed to be "a water soln. of org. iodine." It is also called "intensified iodine." Examm. indicated that the prepn. is a sirup, having an odor like sirup of FeI_2 , which contains I ions but no free I. Metals, such as Na, K, and NH_4 , were absent. Tannic acid was present. Reducing sugars were present in large amounts. The I content is 1.71 g. per 100 cc. The prepn. is similar to the iodo-tannic sirup of the French pharmacies but it is stronger in I than they are. In all respects the I in Iodinol behaves like the inorg. iodides.

L. E. WARREN

The tariff and the crude drug. E. E. STANFORD. *J. Am. Pharm. Assoc.* 9, 966-70 (1920).—Historical discussion of the tariffs on drugs from the beginning of tariff legislation to the present.

L. E. WARREN

Revision of the monographs of official chemicals. H. V. ARNY. *J. Am. Pharm. Assoc.* 9, 971-3 (1920).—A discussion of the meaning of the expression "faint turbidity" as applied to analytical control work. Tests were made which showed that the limits of impurities which could be detected in 100,000 parts of chemical were for Cl in $MgSO_4 \cdot 7H_2O$, 2; Cl in $Na_2HPO_4 \cdot 12H_2O$, 2; Cl in the official $(NH_4)_2CO_3$, 0.5; Cl in Ca glycerophosphate. H_2O , .10; Cl in $ZnSO_4 \cdot 7H_2O$, 0.01; Cl in $BiONO_3$, 0.01; for SO_4 in $NaBr$, 10; SO_4 in NaI , 20; SO_4 in $LiBr$, 50; SO_4 in NH_4Br , 15; SO_4 in the official $(NH_4)_2CO_3$, 50; SO_4 in $CaBr_2 \cdot 2H_2O$, 20; SO_4 in Ca glycerophosphate. H_2O , 500; SO_4 in $ZnCl_2$, 20; SO_4 in KI , 20; for P_2O_5 in $NaH_2PO_4 \cdot H_2O$, 50; P_2O_5 in Ca glycerophosphate. H_2O , 1; P_2O_5 in di-Na glycerophosphate, 1; for Ba in KBr , 25; Ba in KI , 25; Ba in $NaBr$, 25; Ba in NaI , 25; Ba in NH_4Br , 25; Ba in $CaBr_2 \cdot 2H_2O$, 25; and Ba in $SrBr_2 \cdot 6H_2O$, 25.

L. E. WARREN

Practical testing of spirit of camphor. A. B. LYONS. *J. Am. Pharm. Assoc.* 9, 1163-8 (1920).—A discussion is given of the methods in use. The U. S. P. IX method is impractical because there are some forms of camphor which are optically inactive. Few pharmacies are equipped with a polariscope. Another method is to salt out the camphor with $NaCl$ after which it is absorbed by petroleum ether, the increase in vol. of the solvent being the vol. of camphor taken. The method requires a centrifuge and the most exacting attention to every detail to obtain even approx. results. Another em-

pirical method is to add H_2O to a measured vol. of the prepn. until a faint but permanent cloudiness is obtained. It is essential that the EtOH content of the prepn. be known and that the temp. be within narrow limits. The prepn. may be brought to an approx. const. EtOH strength by dehydrating with K_2CO_3 . If the prepn. is essentially free from H_2O it is not necessary to consider the vol. of liquefied K_2CO_3 . If much H_2O be present the liquefied K_2CO_3 must be drawn off and the vol. replaced by EtOH previously treated with K_2CO_3 . An alternate method is to add the prepn. to a suitable vol. of H_2O until a permanent ppt. or turbidity is produced. Dil. the prepn. with 80% EtOH until the camphor content is about 2%. As a preliminary place 7 cc. of H_2O in a small flask and add 1 cc. of the dil. prepn. Shake 1 min., if a turbidity persists prep. other tests using 7.5 cc., 8 cc. and 8.5 cc. The quantity of camphor is obtained from a table constructed experimentally from a known prepn. under similar conditions. L. E. W.

Suggestions on pharmaceutical research. ALBERT SCHNEIDER. *J. Am. Pharm. Assoc.* 10, 502(1921).—A plea for the devotion of research energies to the improvement of human well being.

L. E. WARREN

Curing Japanese burdock. W. E. CLEOPHAS. *J. Am. Pharm. Assoc.* 10, 521-3 (1921).—Freshly collected roots of fall gathering were cut, some transversely and some longitudinally and each cutting was dried at various observed temps., the hourly loss being noted. At 70° the longitudinal sections lost 72.39% in 18 hrs. and the cross sections 72.35% in 10 hrs. At 80° the longitudinal sections lost 72.7% in 15 hrs. and the cross sections 73.3% in 8 hrs. At 60° the spring collected root in longitudinal sections lost 85.26% in 11 hrs. and the cross sections 85.17% in 9 hrs. At 80° the longitudinal sections of spring collection lost 86.78% in 9 hrs., and the cross sections 87.1% in 7 hrs. At 90° the longitudinal sections of spring collection lost 85.12% in 8 hrs. and the cross sections 85.24% in 6 hrs. The greater loss in wt. in the spring collected root is not explained although C. suggests that it may be due to loss of carbohydrate during the winter's stay in the ground. Because of time-saving in drying, C. recommends cutting burdock in cross sections. On the whole 70° is considered the best temp. for drying. Burdock roots contain an oxidase.

L. E. WARREN

The stability of Churchill's tincture of iodine. JOSEPH L. MAYER. *J. Am. Pharm. Assoc.* 10, 525-6(1921).—This tincture is described in the N. F. IV. It contains 16.5 g. of I and 3.3 g. of KI per 100 cc. in a menstruum of about 70% EtOH. M. assayed a specimen for I and KI thrice in 6.5 yrs. The initial assay gave 16.02 g. of I and 3.99 g. of KI. The second (4.4 yrs. later) gave 16.02 g. of I and 3.98 g. of KI. The third (a little over 2 yrs. later) gave 15.91 g. of I and 3.99 g. of KI. It is evident that the prepn. is stable.

L. E. WARREN

The chemistry and therapeutic properties of chaulmoogra oil. L. E. WARREN. *J. Am. Pharm. Assoc.* 10, 510-21(1921).—The history of the treatment of leprosy with chaulmoogra oil is reviewed, the various chcm. derivs. of the oil employed in the treatment of the disease are described and the probable value of the remedy in the cure of the malady is discussed. Chaulmoogra derivs. possess sp. curative properties in all forms of leprosy but their value in tuberculosis has not been demonstrated.

L. E. WARREN

Notes on the moisture and ash content of agar. E. L. NEWCOMB AND C. H. SMYTHE. *J. Am. Pharm. Assoc.* 10, 524(1921).—If exposed to air agar absorbs moisture, as much as 33.7% being taken up by some samples. The moisture, ash and ash insol. in HCl were detd. for 6 market specimens. Moisture was detd. by drying for 24 hrs. at 49° . The findings were 11.3, 15.3, 18.3, 15.9, 11.1, and 8.02%, resp. The av. of the ash detns. were 3.98, 3.80, 4.11, 4.35, 4.50 and 4.33%, resp. The av. values for the HCl insol. ash were 0.53, 0.55, 0.73, 0.65, 0.96 and 1.15%, resp.

L. E. WARREN

Aspidium standards. E. L. NEWCOMB, C. H. ROGERS AND C. W. FOLKSTAD.

J. Am. Pharm. Assoc. 10, 524-5(1921).—The ash and HCl-insol. ash were detd. on 10 specimens supposed to be aspidium. Of the 5 old market specimens 2 were identified as osmunda. The other 5 specimens were freshly collected from authentic specimens of *Dryopteris marginalis*. The av. ash for the old specimens of aspidium were 2.78, 2.87, and 2.61%. The av. ash for the osmunda specimens was 4.13 and 3.37%. For the specimens of aspidium of known origin the ash values were 3.87, 4.18, 4.18, 8.41 and 3.18%, resp. The corresponding values for the HCl-insol. ash were 0.33, 0.67, 0.41, 2.29, 2.30, 0.10, 0.64, 0.50, 4.57 and 0.34%, resp.

L. E. WARREN

Some notes on an undetermined species of *Leptotaenia*. ANON. *Rept. Lab. Am. Med. Assoc.* 13, 73-5(1920).—Tests were made on a specimen of roots said to have been collected in western Nevada from an undetd. species of *Leptotaenia*. Botanists were undecided concerning the classification of the plant, some assigning it to *Leptotaenia dissecta* and some to other species of *Leptotaenia*. The plant is supposed by ranchers to be very poisonous. Alkaloids, acids, glucosides, volatile and fixed oils, gums and resins were reported to be present. Extractives from the roots were being used in medicine. Examin. of the literature revealed no records of chem. examin. of the plant. Since the roots only were obtained, the plant producing them could not be identified. The roots had been cut in longitudinal and cross sections before shipment but the original length was estd. to have been from 8 to 14 in. The sections were of a pale yellow color on the cut surfaces while the bark was of a brownish black color. They had been partially dried before shipment. The roots were so full of a resin-like substance that they could not be ground. The sections were cut into cubes of about 1 cc. vol. and these were extd. with a mixt. of petroleum ether and Et_2O . The insol. part was dried in the air for several days and ground. The ground drug was then exhausted with more of the solvent. The total resin-like ext. amounted to 35.7%. The ext. was a dark red, very viscous fluid having a pleasant, parsley-like odor. It gave 0.28% ash; acid no., 88; sapon. no., 112. It did not give the Liebermann-Storch reaction. The extd. drug contained starch in small amounts, the grains being small and mostly spherical in shape. Some occurred in groups of 2 or 3 grains, thus resembling ippecac. The extd. drug gave ash equiv. to 4.97% of the original drug. Alkaloids were absent.

L. E. WARREN

Examination of some methods of ascertaining the purity of saccharin (McKIE) 12.

JOANIN, A.: *Les remèdes galéniques*. Paris: Laboratories Boulanger Dausel. 4 rue Aubriot. For review see *Bull. sci. pharmacol.* 28, 393(1921).

LUDWIG, ERNST: *Lehrbuch für Aspiranten der Pharmazie*. Newly edited by Gustav Mossler. Vienna and Leipzig: C. Fromme. G. m. b. H. For review see *Chem. Ztg.* 45, 683(1921).

LYONS, ALBERT BROWN: *Practical Standardization by Chemical Assay of Organic Drugs and Galenicals*. Detroit, Mich.: Nelson, Baker and Co. 397 pp. \$3.50.

STEPHENSON, CHARLES H.: *Some Microscopical Tests for Alkaloids*. Philadelphia: J. B. Lippincott Co. 110 pp. For review see *J. Frank. Inst.* 192, 260(1921).

WHITMORE, FRANK CLIFFORD: *Organic Compounds of Mercury*. New York: The Chemical Catalog Co. 397 pp. \$4.50.

Medicinal serums. W. J. PENFOLD. U. S. 1,378,896, May 24. Animal blood, e. g., blood from the horse, is received into vessels contg. an oxalate or other anti-clotting agent and allowed to stand to permit the red cells to settle, the supernatant plasma is sepd. and treated with a Ca salt or other clotting agent, the serum is sepd. from the plasma, and the red cells are filtered and returned to the blood vessels of the animal.

Dentifrice. W. CONGREVE. U. S. 1,379,744, May 31. A dentifrice is formed of soap 12.5, NaCl 12.5, S 25 and powdered chalk 50% by vol.

Dentifrice containing sulfur. W. S. ROGERS. U. S. 1,379,046, May 24. A dentifrice is formed of S 80 and Na perborate 20%.

18—ACIDS, ALKALIES, SALTS AND SUNDRIES

FRED C. ZEISBERG

Steel-supported lead chambers. L. R. VON TENG. *Industriebau* 12, 63-7(1921).—Detailed illus. account of the construction of a modern H_2SO_4 chamber. C. G. F.

The manufacture of bromides. W. HÜTTNER. *Chem. Ztg.* 45, 621-4(1921).—The use of pure raw materials in making c. p. Br and bromides is recommended as better than trying to refine impure products. Precautions as to cleanliness, ventilation, kinds of vessels used, treatment in cases of accident, etc., are given. Fe_3Br_5 is the most important material from which to prepare bromides of the alkalies. App. and methods for making it from Fe turnings and Br are described. To analyze the product dissolve 5 g. of sample in water, acidulate with HNO_3 , and ppt. with $AgNO_3$ in excess. Weigh $AgBr + AgCl$ after drying and melting. Then heat about 2 g. of the melted salts in a stream of Cl, cool and weigh. $[(AgBr + AgCl) - AgCl] \times 1.796 = Br$. KBr is usually made by treating Fe_3Br_5 with K_2CO_3 of special purity (free from Na salts). A soln. of K_2CO_3 is made up to sp. gr. = 1.165, and Fe_3Br_5 added gradually, the soln. being kept alk. The soln. is then filtered from Fe ppt., and evapd. to obtain crystals. Recently KBr has been made also by the old Balard method, i. e., by treating KOH with Br, care being taken not to run Br into hot alkali soln. To reduce $KBrO_3$ formed simultaneously, H_2S or a sulfide (preferably $Ba(SH)_2$) is added to the soln. After filtering out pptd. S and $BaSO_4$, the concd. filtrate is treated with K_2CO_3 , and any impurities present are carefully removed. KBr is also made by treating Br (under water) with crude BaS , $BaBr_2$ and HBr being formed, these compds. are then acted on by solid K_2CO_3 , filtered, tested for impurities, and, if necessary, submitted to special purification. $KBrO_3$ in the KBr renders the latter unsalable. The soln. must be evapd. until a skin forms over it, and then crystd. in dishes, cooling must be slow and shaking avoided, so as to obtain large crystals. NaBr is used much less than KBr, in spite of its higher Br content. It is made like KBr, Na_2CO_3 being substituted for K_2CO_3 . NH_4Br is of least importance; NH_4OH is employed instead of the carbonate in making it, by processes like those outlined above. Generally it is made according to the reaction $4NH_3 + 3Br \rightarrow 3NH_4Br + N$. It must be alk.; otherwise the explosive NBr_3 may be formed.

W. C. EBBAUGH

Potash from kelp. IV. Continuous countercurrent lixiviation of charred kelp. J. W. TURRENTINE AND PAUL S. SHOAFF. Bur. Soils, Summerland, Calif. *J. Ind. Eng. Chem.* 13, 605-9(1921); cf. *C. A.* 13, 2737; also Spencer, *C. A.* 14, 2397, 2840.—A continuous, automatic, countercurrent, multiple-stage lixiviator is described which is based on the employment of any one of the standard continuous rotary filters. The solids to be extd. are alternately extd. and filtered. They flow through the app. countercurrentwise against a stream of the leaching agent. The app., developed for the extn. of K_2O salts and other values from kelp charcoal, is applicable to the washing or extn. of any materials that can be filtered on the standard vacuum filters. The efficiencies obtained and costs of operation are shown. W. H. ROSS

Phosphates of Morocco. ANON. *Compt. rend. acad. agr. France* 7, 502-9(1921).—A general discussion of the phosphate situation in Morocco. F. M. SCHERTZ

Concrete in the construction of salt plants. ANON. *Concrete* 18, 271(1921).—

Examples are given to show that concrete successfully withstands brine solns. under various conditions of concn. and temp. J. C. WITT

Salt, bromine and calcium chloride in 1920. RALPH W. STONE. U. S. Geol. Survey, *Mineral Resources of U. S.* 1920, Part II, 17-25(preprint No. 2, published Aug. 5, 1921). E. H.

Magnesite in 1920. CHARLES G. YALE AND RALPH W. STONE. U. S. Geol. Survey, *Mineral Resources of U. S.*, 1920, Part II, 1-6(preprint No. 1, published July 27, 1921). E. H.

Barytes and barium products in 1919. GEORGE W. STOKE. U. S. Geol. Survey, *Mineral Resources of U. S.*, 1919, Part II, 335-47(preprint No. 24, published July 28, 1921). E. H.

Feldspar in 1919. L. M. BEACH. U. S. Geol. Survey, *Mineral Resources of U. S.*, 1919, Part II, 377-84(preprint No. 27, published Aug. 12, 1921). E. H.

Graphite industry of the United States and Canada. BENJAMIN L. MILLER. *Eng. Mining J.* 112, 207-13(1921). E. H.

Phosphate rock in 1920. RALPH W. STONE. U. S. Geol. Survey, *Mineral Resources of U. S.*, 1920, Part II, 27-35(preprint No. 3, published Aug. 11, 1921). E. H.

Nitrogen products. J. A. HARKER. *Iron Coal Trades Rev.* 103, 166-7(1921); *Chem. Age* (London) 5, 148-51(1921); *Chem. Trade J.* 69, 186-8, 214-6(1921).—A supplement to the Final Report of the Nitrogen Products Comm. of the Ministry of Munitions of 1920 (*C. A.* 14, 2530). The sources of the world's supply of fixed N before the war and at the present time are compared. The totals of the various sources are for 1912, 715,678 tons of N, for 1920, 1,555,300 tons, of which Chile nitrate represented in 1912 and 1920, resp., 57.5 and 30.2%, sulfate (24.5% NH₄) 38 and 26.6%, cyanamide (18% N) 3.1 and 20.9%, nitrate of lime and arc process (13% N) 1.4 and 2.5%, synthetic NH₃ 0 and 19.8%, or for the whole fixation industry, 4.5 and 43.2%. The actual increase in the installed plant capacity is, however, 20 times more than in 1912. The fixation industry is now the largest contributor to the N requirements of the world. Tables are given showing price of nitrate 1913-1920, world's consumption of nitrate 1914-19, proportional amts. of the Eng. exports used for fertilizer and war purposes 1918-20, world's production of by-product (NH₄)₂SO₄ 1913-19, sulfate production (including synthetic) of various countries 1913-19, world's consumption of by-product sulfate 1912-19, and British production, exports and consumption of NH₃ nitrogen 1913-19. Also in *J. Soc. Chem. Ind.* 40, 285-7R(1921). J. L. WILEY

Industrial applications of zirconium and its compounds. F. P. VENABLE. *J. Elisha Mitchell Sci. Soc.* 34, No. 4, 157-62(1919).—Review of com. applications. H. W. EASTERWOOD

Substances of vegetable origin used for gluing wood. (Vegetabilische Holzleime). ERNST STERN. *J. prakt. Chem.* 101, 308-27(1921).—S. calls attention to the possible utilization of vegetable substances in the wood-working industries. Alkali-starches are known to possess marked adhesive power, and S. has made an extended study of the properties these substances, and those of the starch alkali xanthogenates (starch-viscose), with a view towards finding a suitable vegetable glue that might compete with the glues of animal origin. The starch xanthogenates appear to fulfil the requirements of the wood-working industry. They have a binding power (Fugenfestigkeit) very similar to that of glue made from bone. The chem. nature of the alkali starches, and the starch xanthogenates remains indefinite in spite of S.'s equil. studies. Relatively small additions of starch to an NaOH soln. caused marked decrease in cond. S. describes the action between the starch and alkali as being "chemisch-adsorptiv" rather than mechanical. The starch xanthogenates behave very differently from the cellulose xanthogenates, since they "ripen" more slowly. The viscosity of the starch viscose

solns. falls rather rapidly on standing until a condition is reached at which further change is very gradual. No coagulation takes place during the ripening process. Cellulose xanthogenate on the other hand shows an initially decreasing viscosity, followed by a rise in viscosity and a sepn. of hydrated cellulose. Full tabulated data on viscosity, cond., and "binding power" of the vegetable glues are given. L. E. W.

Effect of lightning striking an acid tank (DeWolf) 24. Electrical methods in the fixation of nitrogen (Rowlinson) 4.

SCHMITT, FRANZ AUGUST: *Deutschlands Stickstoff Beschaffung*. Munich: In kommission bei A. Buchholz.

Concentrating sulfuric acid. E. HANSEN. U. S. 1,379,260, May 24. H_2SO_4 is concd. by bringing a hot gas contg. NO into direct contact with the H_2SO_4 . The resulting gas is subjected to condensation and then conducted into an absorption system.

Hydrobromic acid. E. THEIMER. U. S. 1,379,731, May 31. A distillate consisting of strong aq. HBr and contg. substantially no free Br is formed by heating a concd. bromide soln., e. g., a concd. soln. of NaBr, with a concd. inorg. acid such as H_2SO_4 .

Hydrobromic acid from its elements. A. TSCHUDI. U. S. 1,380,084, May 31. Br vapor is caused to flow upward from the lower part of a vertical reaction app. until it meets a current of H and reacts to form HBr, in a flame reaction induced by elec. heating.

Hydriodic acid. G. B. FRANKPORTER. U. S. 1,380,951, June 7. HI is made by adding I to pinene or other hydrocarbon and collecting the evolved gas after removing impurities such as free I from it by contact with red P.

Ammonia from nitrides. G. L. WILLIAMS. U. S. 1,379,668, May 31. NH_3 is produced from nitrides of Al and Si by subjecting them to the action of H at a temp. of about 500–600° under 200 lbs. per sq. in. pressure. Charcoal or MgO promote the reaction.

Ammonia-still. A. ROBERTS. U. S. 1,379,939, May 31.

Chromic sulfate. F. M. MOONEY. U. S. 1,379,578, May 24. In the production of $Cr_2(SO_4)_3$, Na or K chromate or dichromate is treated with H_2SO_4 and the resulting soln. is refrigerated to effect sepn. of Na_2SO_4 as crystals. The crystals are sepd. centrifugally and the liquor is treated with SO_2 in order to form $Cr_2(SO_4)_3$. Cf. *C. A.* 14, 1193.

Crystallized sodium sulfate and similar salts. G. T. WALKER. U. S. 1,379,735, May 31. A soln. of $NaHSO_4$ is mixed with ground phosphate rock in proportions to produce a soln. of acid Ca phosphate and Na_2SO_4 and sufficient Na_2CO_3 is added to the soln. to render it neutral to litmus. The soln. is then filtered and cooled to form cryst. Na_2SO_4 .

Potassium sulfate from carbonate solutions. H. P. BASSETT. U. S. 1,380,035, May 31. Saline lake brine or a similar liquor contg. K_2CO_3 is treated with at least sufficient Na_2SO_4 to give an equimol. ratio with the K_2CO_3 . The soln. is evapd. and Na_2CO_3 is crystd. from it and K_2SO_4 is then crystd. from the cooled soln.

Potassium compounds from ashes of plants. J. ENDLER. U. S. 1,380,195, May 31. Ragweeds or other plants are reduced to ashes and the ashes are subjected to the action of steam to provide moisture for lixiviation in order to obtain K_2CO_3 .

Cyanamide from calcium cyanamide. J. H. LIDHOLM. U. S. 1,380,223, May 31. Cyanamide practically free from dicyandiamide is prep'd. by gradually supplying Ca cyanamide to an aq. soln. and pptg. the Ca by addition of CO_2 .

Recovering potassium salts from solutions. J. W. HORNSEY. U. S. 1,380,383,

June 7. Searles Lake brine or other similar solns. contg. K compounds together with contaminating salts such as Na and B compds. are evapd. under pressure at a temp. above the b. p. of the soln. at atm. pressure until a large part of the contaminating salts is thrown out of soln. The residual soln. is then sepd. from the deposited substances and cooled to effect sepn. of the K salts.

Aluminium compounds from silicates. V. M. GOLDSCHMIDT. U. S. 1,380,552, June 7. Labradorite-anorthosite or similar material rich in plagioclases contg. combined Na is treated with a mixt. of H_2SO_4 , HCl and HNO_3 nor other acid not contg. F, to form a soln. contg. Al salts and the latter are recovered from the soln. by pptn. according to usual methods. Cf. *C. A.* 14, 2400.

Soluble compounds from feldspar. W. GLAESER. U. S. 1,379,914, May 31. Powdered feldspar is mixed with $CaCl_2$, Fe or Fe oxide and coke and the mixt. is heated to a temp. of about 900° or higher (in order to form KCl) out of contact with air.

Apparatus for producing alkali metal cyanides. A. KAUFMAN. U. S. 1,379,187, May 24. The app. is adapted for the production of alkali metal cyanide such as $NaCN$ by the action of N on mixts. contg. carbonate and C. It comprises a retort with a zone for cooling and discharging the reaction products, a zone above with an external heating chamber for heating the charge to reacting temp., a preheating zone above this and a still higher unheated zone through which N is admitted to the charge. The passage of gases about the preheating zone may be regulated and a pipe is provided for leading off reaction gases from the lower zone.

Halogens from natural brines. H. TOBLER. U. S. 1,380,851, June 7. Natural brines are oxidized to liberate free halogen, e. g., Br, and the liberated halogen is extd. from the soln. by the action of a light hydrocarbon oil such as a fraction of Pa. petroleum b. 110 – 160° .

Nitrogen oxides. C. BOSCH, A. MIRASCH and C. BECK. U. S. 1,379,387, May 24. N oxides are produced by passing a mixt. of NH_3 and O or air over a hot granulated catalyst which may be formed of lumps of oxides of Fe, Mn, Cr or U.

Zinc oxide direct from oxidized zinc ores. J. ALLINGHAM. U. S. 1,380,514, June 7. Oxidized Zn ore is treated with a solvent soln. contg. H_2SO_4 and $NaCl$, the soln. is sepd. from the residue, treated to remove compds. of metals other than Zn, and $Ca(OH)_2$ is then added to the soln. to ppt. $Zn(OH)_2$. The latter, while still in the soln., is treated with CO_2 to form $ZnCO_3$ and the $ZnCO_3$ is sepd. and ignited to form ZnO . U. S. 1,380,515 relates to a similar process in which however trota is added instead of $Ca(OH)_2$ to ppt. the Zn as $ZnCO_3$. The latter is sepd. and ignited and the soln. from which it has been sepd. is treated to recover Na_2SO_4 , part of which is added to the soln. produced by the solvent action of the ore, in cyclic operation, to remove Ca from the soln.

Reducing aluminium oxide. L. BURGESS. U. S. 1,379,523, May 24. Material such as bauxite which contains Al_2O_3 in finely divided condition is mixed with petroleum pitch and the mixt. is then coked and afterward subjected to the action of an elec. arc enclosed in the mass, in order to produce Al carbide or other reduction products.

Casein-tung-oil product adapted for use in sheet form. E. T. OAKES. U. S. 1,380,494, June 7. Gelatinized tung oil is mixed with a solidified casein prepn. such as one formed with CH_2O and casein in order to form a mixt. suitable for making celluloid-like sheets or elec. insulating material.

Purifying graphite. C. W. WOODRUFF and R. H. PAUSCH. U. S. 1,380,458, June 7. Purification of graphite or C-bearing material is effected by treating the material with gaseous HF and washing out the sol. compds. thus formed.

Adhesive for use on wall paper. A. LAFLAMME. U. S. 1,380,568, June 7. The adhesive is formed of caustic alkali 2 oz., rosin 1 lb., NH_4Cl 4 oz., Pb acetate 4 oz., glue

1 lb., whiting 3 lbs., plaster 3 lbs., KNO_3 1 lb. mixed together with 4 gals. of boiling H_2O to which are added 10 lbs. of flour mixed separately with 4 gals. H_2O .

Water-glass adhesive. J. D. MALCOLMSON. U. S. 1,379,639, May 31. The vol. of water-glass is increased without impairing its adhesiveness by adding brine to the water-glass and then redissolving in the water-glass the silica coagulated by the addition of the brine.

Graphitized vulcanized fiber. E. G. ACHESON, JR. U. S. 1,379,155, May 24. Graphitized fiber or vulcanite is prep'd. by beating fibers of paper stock with finely divided graphite, forming the mixt. into a web, treating the web with a gelatinizing agent such as ZnCl_2 and afterward washing and seasoning it. The product thus formed is adapted for use in bearings. U. S. 1,379,156 relates to the manuf. of graphitized fiber by treating a formed paper web with graphite in colloidal form and then subjecting it to the action of ZnCl_2 .

Magnet cores. I. L. MILTON. U. S. 1,378,969, May 24. Magnet cores are baked, demagnetized and then baked again, in order to render their elec. properties more uniform.

Heat-insulating material. J. J. WANGENSTEIN and H. FEGRAEUS. U. S. 1,379,143, May 24. A heat-insulating mixt. adapted for use in covering pipes is formed of peat and moss.

Printing plates made with resinous substances. W. J. YEOELL. U. S. 1,379,430-1-2-3-4, May 24. These pats. relate to laminated printing plates formed in part of natural resinous substances, such as shellac, or synthetic resins.

Sound-record composition. E. DE STUBNER. U. S. 1,379,729, May 31. Can-deilla wax and stearic acid are employed in partially saponified solid soln. with $\text{Mg}(\text{OAc})_2$ and Na and Al hydroxides in the manuf. of sound-records. Other materials may be added, e. g., paraffin.

Cleaning mixture. F. H. ADLER. U. S. 1,378,931, May 24. A mixt. adapted for cleansing wind-shields is formed of machine oil 1 lb., turpentine 2 lbs., tobacco 16 lbs., bran 16 lbs. and wood ashes 144 lbs.

Treating lamp wicks. J. FEENEY. U. S. 1,379,857, May 31. Lamp wicks are boiled in a milk of lime of 1.10 sp. gr. for 3 hrs. or until the sp. gr. of the soln. has changed to about 1.5 and dried; in order to render them more durable and otherwise improve their properties.

Abrasive mixture. H. S. HOLMES. U. S. 1,380,382, June 7. An abrasive mixt. adapted for grinding engine valves is formed of finely divided Si carbide or similar abrasive material 38, H_2O 48, starch 5, glycerol 0.5, CaCl_2 8 and a preservative, e. g., CH_3O 0.5 part.

19—GLASS, CLAY PRODUCTS, REFRactories AND ENAMELED METALS

G. E. BARTON, C. H. KERR

The training of the glass-works chemist. ALEXANDER SILVERMAN. *Chem. Met. Eng.* 25, 332(1921). E. H.

The manufacture of constructional glass in the United States. E. WARD TILLOTSON, JR. *J. Soc. Chem. Ind.* 40, 155-9T(1921); *Nat. Glass Budget* 37, No. 16, 1-7(1921).—Descriptive of the Lubbers and Colburn processes for the mechanical production of window glass, and of the manuf. of plate, wire, and miscellaneous sheet glass. At present about $\frac{1}{3}$ of American window glass is still hand made. The Colburn machine is producing about $\frac{1}{4}$ of the total window glass requirements. By this method

sheets of any thickness up to $\frac{1}{4}$ " can be drawn continuously, and it becomes a competitor in the plate glass industry as well as in the window glass. J. B. PATCH

The relation between the density and composition of glasses. W. L. BAILLIE. *J. Soc. Chem. Ind.* 40, 141-8T(1921).—The moduli proposed by Winklemann and Schott have been found to lead to discrepancies exceeding 2% in the case of glasses of normal type. The more satisfactory moduli proposed by Tillotson have been shown to be susceptible of certain improvements. New moduli are proposed whereby glasses of extreme compn. may be included with as high a degree of accuracy as was formerly possible for glasses of normal compn. Applied to 91 glasses, the new moduli have been found to lead to the smallest av. error, the smallest mean sq. error and the lowest algebraical sum of errors. Fourteen tables are given.

Oxide.	Densities of glass-forming oxides in free and combined states.		
	Densities in free state.	Remarks.	Densities in combined state.
Detd.	Winkelmann.	Tillotson.	Proposed.
SiO ₂	2.22	Deville 1855	2.3
Al ₂ O ₃	3.85	Rammelsberg	4.1
Sn ₂ O ₄	6.69	—	—
B ₂ O ₃	1.79	Clarke	1.9
As ₂ O ₃	3.74	—	4.1 (4.1)
ZnO	5.65	Schröder	5.9
BaO	5.00	Clarke	7.0
CaO	3.30	Moissan	3.3
MgO	3.60	Clarke & Moissan	3.8
PbO	9.30	Clarke	9.6
K ₂ O	2.66	—	2.8 (2.8)
Na ₂ O	2.55	—	2.6
			2.8
			3.20

* Provisional only. † In absence of all alkali oxides, the value 4.30 is to be taken.

J. B. PATCH

Tests for laboratory resistance glassware. ANON. *J. Proc. Inst. Chem.* 1920, Part III, 202-10(1920); *Analyst* 45, 396-7(1920).—The Glass Research Committee of the Inst. of Chemistry use the following tests to ascertain whether or not lab. glassware may safely be considered as resistance glass: (1) *Preliminary treatment*.—Cleaning with boiling water followed by 5% acetic acid. (2) *Treatment in autoclave*.—This affords a rapid sorting test for resistance glass. The glass vessel, filled with distd. water, is heated for 3 hrs. in an autoclave at a registered pressure of 4 atms. Any matter dissolved is then estd. by drying a portion of the soln. for 1 hr. at 120°, followed by ignition (not above 650°) for 3 min. The result is expressed as mg. residue per sq. dm. The alkalinity of the rest of the water is detd. by titration with methyl orange as indicator. Results are expressed as cc. 0.01 *N* H₂SO₄ per sq. dm. Residue must not exceed 4 mg. per sq. dm. Alkalinity should not require more than 5 cc. 0.01*N* H₂SO₄ per sq. dm. The glass must not flake nor peel. (3) *Treatment with reagents*.—HCl (sp. gr. 1.15) is boiled for $\frac{1}{2}$ hr. in the vessel to be tested, the whole being kept in an air bath at 140°. This is repeated 3 times (each time with fresh acid), and finally the dissolved residue is dried down with a little (NH₄)₂CO₃, ignited and weighed. SiO₂ and Zn are both to be tested for in the residue; after the acid treatment the same vessel is tested by boiling in it 0.5 *N* NH₄Cl and NH₄OH, the dissolved matter, if any, being detd. as before; all results are expressed as mg. per sq. dm. Finally 0.5*N* NaOH is employed, the residue being tested for Zn and Pb. Residue from HCl test must not exceed 2 mg. per sq. dm., and that from NH₄Cl and NH₄OH test 1.5 mg. per sq. dm. (4) *Heat tests*.—Alternative methods.—(a) The flask or beaker is heated in an air oven to 120° for $\frac{1}{2}$ hr., and then instantly immersed in cold water. (b) The vessel is filled with soft paraffin wax and

heated to about 155° and plunged in cold water; this is repeated at increasing temps. (25° intervals) until it breaks. Good quality vessels will stand this treatment up to 200° . (c) A soln. of CaCl_2 (sp. gr. 1.33) is boiled in the vessel for 5 min. and the whole then plunged into water at 0° . (d) Another vessel full of water at 0° is plunged into boiling water. Vessels should not crack when submitted to tests under (a), (c) and (d). (5) *Tests for As and Sb.*—Full accounts of testing for these elements are given, with a diagram of the app. for distn. (6) *Annealing.*—The vessels are examd. under polarized light to detect internal stresses.

J. B. PATCH

Tests for laboratory porcelain. ANON. *J. Proc. Inst. Chem.* 1920, III, 210-14; *Analyst* 45, 397-8 (1920).—The tests described are those adopted by the sub-committee on porcelain of the Glass Research Committee of the Inst. of Chemistry. (1) *Appearance, shape and weight.*—These should at least come up to that of the porcelain in former use. The wts. of vessels should not exceed pre-war av. wts. for articles of similar size. (2) *Tests for porosity of body and imperfections in glaze (dye test).*—A 0.5% soln. of eosin in water answers well. Some vessels are filled and broken pieces of others immersed in the sol. for 18 hours, after which they are rinsed, dried and examd. with a hand lens. Good porcelain shows no staining at all. If the articles fail under this "dye" test, it is extremely unlikely that they will stand the remaining tests. (3) *Resistance to heat and sudden changes of temperature.*—(a) The vessels are heated by direct application of Bunsen burners, and then lifted with small cold tongs onto cold pipeclay triangles to cool. This is repeated six times and the "dye" test again applied. (b) After thorough drying the same vessels are heated as before and cooled by being placed on cold metal (clean sheet lead). The "dye" test as before is then applied. (4) *Constancy of weight and resistance of glaze to high temperatures.*—(a) Vessels should suffer no loss of wt. after heating for several hrs. at a good red heat and should show no tendency to stick to pipe clay, silica or other supports. (b) The condition of the glaze should be noted after heating for 4 hrs. at 950° . No blistering or coaging should result. (5) *Cleaning test.*—Cleaned, ignited and weighed vessels should show no change in wt. after immersion for 12 hrs. in dil. acid followed by rinsing, wiping and ignition. Under this test, if the body is porous, liquid will have entered and on the application of sudden heat particles of glaze or porcelain will be thrown off by vapor generated from the imprisoned liquid, with resulting loss in wt. (6) *Resistance of glaze to acid and alkali.*—The loss in wt. sustained after prolonged treatment with boiling acid, Na_2CO_3 and NaOH should not exceed that found in comparison with high grade pre-war porcelain. Two simple tests for *Pb* are finally given: (1) The porcelain is touched with HF , warmed, and the acid allowed to evap., followed by H_2S water faintly acidified with acid. (2) Fragments of the porcelain are heated to bright redness for 4 hours in a current of H_2 . No darkening should ensue.

J. B. PATCH

The alkalimetric testing of glassware. F. MYLIUS. *Z. angew. Chem.* 34, Aufsatzteil, 281-4 (1921).—A paper on the eosin reaction. Cf. *C. A.* 2, 450; 4, 2557; 8, 1000.

J. B. PATCH

Modern development in manufacture of building glass. ROBERT G. SKERRETT. *Compressed Air Mag.* 26, 10135-42 (1921); *Glass Ind.* 2, 194-7 (1921).—A descriptive article of modern processes with numerous first class illustrations. J. B. PATCH

The steam gage tube situation. J. F. SPRINGER. *Glass Ind.* 2, 183-7 (1921); 3 illus.—A very complete description of the hand process of drawing glass tubing, and of the impossibility of attaining precision in the diam. and wall dimensions of drawn tubing.

J. B. PATCH

Comparative strength of prescription bottles. A. W. BITTING. *Glass Ind.* 2, 187 (1921).—The results of tests upon 28 sizes and types of prescription ware of $\frac{1}{2}$ to 16 oz. capacity are tabulated. The data include height, cross section, cubic displace-

ment, weight, capacity, ratio of weight to capacity, vertical resistance, lateral resistance, hydrostatic resistance, impact resistance, maximum and minimum thickness. In the strength tests the round bottles were best except that the panel shaped bottles had the highest resistance to lateral pressure. The square bottles were among the weakest in all tests except in the resistance to hydrostatic or internal bursting pressure in which the ovals were poorest. Classed as to size the large bottles offered the best resistance to vertical pressures and the small bottles to hydrostatic pressures. The lateral and impact resistances were very uniform for all sizes. All of the bottles tested were the product of one firm.

J. B. PATCH

Electrically heated glass-annealing leers. E. F. COLLINS. *J. Am. Ceram. Soc.* 4, 335-49(1921); 8 figs.; *Glass Ind.* 2, 107-9(1921); *Chem. Met. Eng.* 25, 119(1921); *Elec. Review* (Chicago) 79, 204-5(1921).—The annealing time was reduced from 5 to 2.3 hours when variations in temp. of the leer were reduced from $\pm 10^\circ$ to $\pm 2.5^\circ$, in the case of a glass the annealing temp. of which was 476° . Electric heat with its automatic control holds temps. within 0.6% in ranges required for annealing, as shown by tests, both when the temp. changes 23° per hour and when the annealing treatment covers a month in time. The vertical leer offers many apparent advantages and a higher thermal efficiency. Leers of capacities of 500-600 lbs. ware per hour show efficiencies in ratio of 3 to 5 in favor of the elec. leer of the vertical type. Operating costs while not yet available are believed by the author to be favorable to the elec. leer. J. B. P.

Plasticity of clays. J. W. MELLOR. *Trans. Faraday Soc.* 1921, May 31 (adv. proof).—M. discusses the theory of the plasticity of clay from the standpoint of physical and mechanical properties, and also the relative value of the factors involved in proposed formulas for plasticity detn. An app. is described for measuring plasticity by means of forming spheres of standard size and applying pressure until outside cracks appear. In consideration of plasticity, he discusses grain size of clay, effect of acids, alkalies and salts on sedimentation, and the action of colloidal matter. Directions are given for isolating colloidal clay by suspension and evapn. RUSSELL M. JONES

Manufacture of gas-clinker brick at the Wurzburg gas plant. F. GREINEDER. *Gas u. Wasserfach* 64, 245-7(1921).—Bricks suitable for building purposes are being made from the clinker from the gas retorts and generators. The plant has sufficient assorted clinker to make 1,150,000 bricks yearly. For making 1000 bricks there is required 4.5 cu. m. of ground clinker, 0.5 cu. m. of cement, 0.8 cu. m. of water. The total cost per 1000 bricks, including depreciation and interest charges, is 437.19 marks. About 7.5% is being realized on the investment. J. L. WILLY

The artificial drying of bricks. F. SCHOLZ. *Kalk-, Gips- u. Schamotte-Zig.* 27, Nos. 3 and 4 (Feb. 27 and 21, 1920); *Chimie & industrie* 5, 559(1921).—Review of the various sources of heat used for the drying of bricks: exhaust steam, heat lost by radiation from the kilns, heat lost from the kilns in the cooling chambers, flue gases from the kilns and from the boilers. A. P.-C.

Manufacture of fireproof materials and their use. ERNEST SCHRIEBER. *Feuerungstechnik* 15, 69-70(1921).—*Schamotte* is made by mixing together fireclay and quartz and burning the mass to a hard stone. Quartz-free schamotte contains clay and schamotte, while quartz-schamotte contains quartz also. Quartz-schamotte stone under 3% Al_2O_3 is considered acid. *Dinas stone* has a high SiO_2 content in the form of quartz. German *Dinas* stone is made by binding quartz with a refractory clay, and contains 84-90% SiO_2 . English *Dinas* stone is made by binding quartz with CaO , and contains 97-98% SiO_2 . The quartz must be calcined or the stones will swell. The mixts. are pressed together into forms, carefully dried and burned at 1500° F. *Dinas* stone is used in masonry which must withstand a very high temp. and is highly acid. In making MgO stone, $MgCO_3$ is burned, then ground, bound with tar and formed into shape.

The mixt. is then burned at a very high temp. It is used in open-hearth furnaces, etc. Refractory bricks should not be set up with common clay but with a refractory mortar. For use with basic materials, a good mortar consists of 2 parts schamotte meal and one part plastic fireclay mixed with water to the proper consistency. For acid materials a mixt. of quartz meal and clay of high SiO_2 content is used. Refractory materials should not melt lower than Seger Cone 26. Anything lower cannot be considered as a refractory. The best schamotte stone melts at 36 and the SiO_2 stone at 35. H. C. P.

Report of the Refractory Materials Research Committee to the Institution of Gas Engineers. L. BRADSHAW AND W. EMERY. *Gas J.* 155, 157-60 (1921).—*Jointing materials for refractories. I. Softening point of mixtures of silica brick and clay firebrick.*—Various mixts. of finely ground SiO_2 brick with fireclay brick were made into cones and the refractoriness was detd. The addition of a small amt. of fireclay to SiO_2 brick produces a greater effect than a corresponding amt. of SiO_2 brick added to fireclay brick. Thus the addition of 25% fireclay to SiO_2 brick reduces the refractoriness by 4½ cones, and of about 43% by 6 cones, while the addition of these amts. of SiO_2 brick to fireclay brick produces differences of 2 and 3 cones, resp. The eutectic mixt., which softens at Seger cone 19-20, has the compn. 15.01% Al_2O_3 , 80.32% SiO_2 , corresponding to 1 Al_2O_3 : 9 SiO_2 . By submitting some of the same mixts. to a refractory test under load, it was found that the differences between the softening temps. with and without load are less in the case of siliceous mixts. than for those rich in fireclay (C. A. 10, 1782; 12, 2118). When coarser-grained mixts. are used, the effect upon the softening point is less marked. *II. Mixtures of fireclay with fireclay grog.*—The effects of mixing carefully graded amts. of grog and fireclay in the prepns. of mortars are discussed. Grog diminishes the shrinkage of the clay but also reduces the binding power and mechanical strength and makes the mixt. more difficult to spread. Coarse, medium and fine grades of clay and grog were formed into briquets for the measurement of contraction and resistance to crushing. The results are tabulated. The sharp increase in the contraction of the clay with diminishing grain size is clearly shown, as also the corresponding increase in mechanical strength, and the resistance to slag penetration. The addition of 50% of grog of the same grade largely reduces the contraction, and allows a greater penetration of slag. Differences of the same kind, but of less magnitude, are obtained by the use of only 33% of grog. Also a briquet of fine clay with coarse grog has a much greater contraction and crushing strength, and suffers less slag penetration in the mass than a mixt. of coarse clay with fine grog. Of the mixts. examined, those composed of mixed grades of clay and grog appear to give the best results, being mechanically strong, with a sufficiently small contraction, and settling between bricks to a hard, compact mass, which is free from cracks and is not easily attacked by molten slags. By substituting ungraded building sand for grog, much inferior results were obtained. Study is being made of the beneficial effects that the addition of a small amt. of fine SiO_2 to mixts. of clay and grog would have. *Influence of oxidizing and reducing atmospheres on refractory materials. I. Behavior of clay pyrometers and fireclay bricks in coal gas.* C. A. 15, 2972. J. L. WILEY

Behavior of refractory materials under load at high temperature. K. ENDELL. *Stahl u. Eisen* 41, 6-9 (1921).—The behavior of small cylinders 50 mm. long and 50 mm. in diam. when heated to various temps. under a pressure of 1-8 kg. per sq. cm. was studied. The results with a pressure of 1 kg. may be summarized as follows: Fine clay bricks soften at 1400°, magnesite bricks at 1500°, silica bricks do not soften below 1600° but become fragile, C bricks are unaffected at 1720° for 5 hrs. R. S. DEAN

Modern production of (porcelain) suspension insulators. E. H. FRITZ AND G. I. GILCHRIST. *J. Am. Inst. Elec. Eng.* 40, 470-9 (1921).—A review of progress in making porcelain. The chief improvement is that the feldspar and flint, which were formerly

mixed together with the clays in the blungers, are now first wet-ground in ball mills long enough to produce the necessary fineness. The higher dielec. and mechanical strength obtained more than counterbalances the cost of the extra operation. Care in filtering the slip produces filter cakes of such qualities as to eliminate the necessity of aging.

CHARLES HECKER

Uniform high temperature throughout a large volume (NORTHRUP) 1. Magnesite in 1920 (YALE, STONE) 18. Use of niter cake for making sulfate of ammonia and sodium sulfate (NORRIS) 21. Choice of electric furnace refractories (ANON) 4. Industrial electroosmosis (ROWLINSON) 4.

PELKA, Orro: Chinesisches Porzellan. Leipzig: H. Schmidt and C. Günther. M 30.

Dolomite bricks. C. H. BREERWOOD. U. S. 1,380,701, June 7. Dolomite contg. a small amt. of Fe is ground very fine, burnt at a temp. sufficiently high to vitrify or amalgamate it, finely reground, compressed under high pressure and burned to form a vitrified brick adapted for lining kilns or steel furnaces.

Furnace linings. C. H. BREERWOOD. U. S. 1,380,700, June 7. A refractory material suitable for lining furnaces or for making crucibles is prep'd. by introducing dolomite and Fe or similar material adapted to form a sinter in a finely divided condition into a furnace, mixing with it small pieces of coal tar, Fe, fire brick or other material to which the finely divided material adheres in its passage through the furnace to form balls, and continuing the heating for a sufficient time to aggregate the materials to the desired extent.

20—CEMENT AND OTHER BUILDING MATERIALS

C. N. WILEY

Judging the quality of portland cement. R. J. COLONY. *Trans. Am. Inst. Mining and Met. Eng.* No. 1039 (Feb. 1921). Chem., mech. and petrographic methods are suggested for detg. the quality of cement to supplement the standard tests. A long series of studies has shown that the 3 constituents that form the bulk of Port. cement (CaO , SiO_2 , and Al_2O_3) exist as fixed components with definite chem. compn. and const. optical properties. With these 3 compds. Forming apices of a triangle, a diagram is made and the percentages of the samples are plotted. About 50 analyses were plotted on the diagram and all but two fell within a restricted triangular area. The changes of the tricalcium silicate, tricalcium aluminate, tricalcium ferrite, beta calcium ortho silicate and gypsum when H_2O is added to cement are described briefly. Limiting ratios of cement based on a minimum silicate content are used as a check and cements having a lower ratio are regarded with suspicion. The results of tests and analyses of 6 samples are shown. The use of the limiting ratios is a simple easy method of judging the quality of Port. cement when used in connection with the usual standard tests. Results obtained are so suggestive that further work is now in progress. C. N. W.

Relation between tensile and compressive strengths of cement mortars. J. R. DWYER. *Concrete, Mill Section* 18, 99-101 (1921).—On the basis of a considerable no. of tests D. concludes: The T-C ratio varies greatly with differences in compressive strengths of portland cement mortars, and also varies somewhat for difference in materials and proportions. The variation is greatest at comparatively low compressive strength, and below about 1,500 lbs. for 2-in. cubes may be extremely misleading. It is evident from data presented herewith that the tensile test favors cements which

are weak in compression, and gives little indication of their comparative compressive strengths. J. C. WITT

The relation of carbon dioxide and moisture to the setting time of cement. S. L. MEYERS. *Concrete, Mill Section* 18, 128-30(1921).—M. states: CO_2 is readily absorbed by tricalcium aluminate. This absorption of CO_2 by the aluminate in portland cement causes an acceleration of setting time. This acceleration of setting time is due to the positively charged aluminate in dispersion adsorbing the negatively charged carbon ion, resulting in coagulation after the cement is gaged with water. The effect of hydration alone is to retard the set, but in combination with CO_2 hydration indirectly acts as an accelerant by aiding carbonation. J. C. WITT

Automatic machine tests setting time. C. R. HILL. *Concrete* 18, 126(1921).—A machine is described for automatically detg. the setting time of cements and plasters by means of Gillmore needles. The cement test pat is carried on a plate which moves in a horizontal plane at a speed which may be regulated to accommodate different classes of materials. The needles are lowered to the cement at frequent intervals by the action of a cam. J. C. WITT

The effect of some physical conditions on calcium sulfate cements. C. L. HADDON. *J. Soc. Chem. Ind.* 40, 122-37(1921).—Brief description is given of setting of anhydrous CaSO_4 cement and discussion of expansion and contraction in setting. Measurements of expansion were made by LeChatelier's app. on a number of samples. Results of expts. show (1) the expansion was least when accelerating solns. were used, and greatest when retarders were used; (2) wet set plaster using 5% soln. of sulfate as accelerator, although reaching its max. strength within 24 hrs., yet continued to expand during crystn., (3) wetness has great effect on tensile strength and the degree of wetness effects expansion, (4) the expansion under normal conditions is very small—about 0.1%—and ceases within 7 days. The effect of expansion on the tensile strength and the weakness of flooring plaster by wetness and also the effect of mineral oils are discussed briefly. It is suggested that the conditions for briquet breaking should be precisely as is done with port. cement—leave the briquets in the mold for 24 hrs., take them out and place them in H_2O and then break the wet briquets after a week. C. N. WILEY

Proportioning of concrete by mechanical analysis. A. N. DAWKINS. *Commonwealth Eng.* 9, 303-5(1921).—Tests were made to det. the suitability of gravel obtained from Findon, S. Australia, for concrete making and to verify the results of Taylor and Thompson that (cf. *C. A.* 11, 2033) for a concrete of greatest d. that is for the greatest strength, the proportioning of each size should agree with a certain curve. The cement, sand and gravel were combined theoretically to find a proportion which would give a curve corresponding most nearly to the ideal mix curve. It was found that by removing 40% of the sand and making a 1:6 mixt. or by removing 50% of the sand and making a 1:5½ mixt., curves were obtained that agreed fairly well with the ideal mix curve. Compression tests were made on 3-in. cubes to verify these theoretical mixes. The 1:5 mixt. with 50% of the sand removed proved stronger than the 1:6 mixt. with 40% of the sand removed but was not considered worth the higher cost. The results show that a suitable concrete can be made from the Findon gravel and proved the correctness of the statement by Taylor and Thompson. C. N. WILEY

Physical properties of Philippine concrete and concrete aggregates. ALBERT E. W. KING. *Philippine J. Sci.* 18, 105-220(1921).—Ultimate compressive strength tests have been conducted on 1677 concrete specimens more or less representative of concrete made in the Philippines during the period 1908 to 1918. Lab.-made concrete specimens proportioned 1:2:4 and aged 28 to 31 days give an av. ultimate compressive strength of 2245 lbs. per sq. in., and field-made concrete test pieces of 1:2:4 and aged 25 to 42 days give an av. ultimate compressive strength of only 980 lbs. per

sq. in. The lowest compressive strength, 177 lbs., given by 1:2:4 concrete was obtained from specimens coming from Leyte. Field specimens made 1:2:5 and aged 26 to 36 days average 944 lbs. Test pieces made in the field of 1:3:6 concrete and aged 27 to 42 days average 705 lbs. compared to 1104 lbs. for lab. pieces. Aging beyond 28 days in most instances exercised an inconsiderable influence on the strength. In several cases an average decrease in compressive strength is characteristic of old test specimens. Most of the low av. compressive strengths may be traced to use of fine sands, some to faulty proportioning of cement and a few to incomplete mixing. Sands unsuitable for concrete work have been used throughout the Philippines although efforts are made to have sands tested before use.

C. N. WILEY

The utilization of slag: The manufacture of slag building bricks. H. KOCH. *Industriebau* 12, 23-7(1921); 13 illus.—Detailed account of the Elberfeld plant. Relative costs for 1 cu. m. of wall: Ordinary clay or red brick requires 114 kg. coal in the course of manuf.; slag brick with portland cement binder, 64 kg. coal; slag brick with blast furnace cement binder, 33 kg. coal.

C. G. F.

Rotary kiln lime-burning plant. ANON. *Blast Furnace and Steel Plant* 9, 467-8 (1921).—An illustrated description of the new plant of the Granite City Steel Works.

E. H.

Slate in 1919. G. F. LOUGHLIN AND A. T. COONS. U. S. Geol. Survey, *Mineral Resources of U. S. 1919*, Part II, 369-75 (preprint No. 26, published July 29, 1921).

E. H.

Toxicity of wood preservatives. III. C. J. HUMPHREY, RUTH M. FLEMING AND E. BATEMAN. *J. Ind. Eng. Chem.* 13, 618-21 (1921).—The Petri-dish method was used in studying the effect of preservatives on *Fomes Annosus*. Fr. In the case of com. beechwood creosote, the KOH-sol. portion of the distillate (consisting of phenolic compds.) was by far the most toxic. Tests on beechwood creosote fractions taken every 5° showed that the toxicity of fractions increased rapidly with increased b. p. up to 225°. Thereafter the toxicity remained approx. const. Tests on samples of "Cresoil" (coal-tar creosote) showed increasing toxicity with increasing cresylic acid content. Data on various com. preservatives are included. Of these a sample contg. 23.8% $C_6H_4(NO_2)_2$ was the most toxic.

LOUIS E. WISE

Practical tests with the wood preservative "Basilite." ROBERT NOWOTNY. *Oesterr. Chem.-Ztg.* 24, 84-5 (1921).—Basilite (cf. Malenovic, *Elektrotech. Z.* 16(1913); cf. *C. A.* 8, 2470) consists of a mixt. of 88.89% NaF and 11.11% dinitroaminophenol [probably picramic acid. ABSTR.], and appears to be 11 times as powerful an antiseptic as $ZnCl_2$, and 12 times as powerful as $CuSO_4$ *in vitro*. In N.'s tests spruce telegraph poles were impregnated with 3 kg. of Basilite per cu. m. of wood and then exposed. Field tests carried out over a period of 6 years indicate that only 1.62% of the poles under observation were destroyed. During the same time period and under similar conditions poles treated with $CuSO_4$ by the Boucherie process showed a loss of 22.84%. The av. life of poles treated with Basilite has been estd. as 21 years but no expts. over such protracted time periods have been carried out.

LOUIS E. WISE

Wood preservation with tar and tar products, and the effectiveness of the tar constituents. FRITZ PETERS. Berlin. *Brennstoff Chem.* 2, 193-9 (1921).—A comprehensive review, without any new data. P. quotes with approval the conclusions of v. Schrenck (*C. A.* 8, 2934; 9, 703, 2702).

W. B. V.

Toxicity of various fractions and combinations of fractions of coal-tar creosote to wood-destroying fungi. HENRY SCHMITZ AND SANFORD M. ZELLER. *J. Ind. Eng. Chem.* 13, 621-3 (1921).—Of the various fractions of a creosote oil (d_4^{20} 1.048) distd. by the standard method of the American Soc. for Testing Materials, those b. 235-70° and 270-315° appeared to be the most toxic towards *Polyporus lucidus* and *Lenzites*

saeparia Fr., acting upon yellow poplar and white pine sawdust. The least toxic fraction distd. above 355°. In the case of most fractions the minimum % of creosote required to inhibit growth of the organism lay between 2 and 4%. The original should be consulted for details in exptl. technic.

Louis E. Wise

Substances of vegetable origin used for gluing wood (STERN) 18. Ferro-concrete in the construction of by-product coke-oven plants (ANON.) 21. Concrete in the construction of salt plants (ANON.) 18.

McADE, RICHARD K.: Portland Cement. Its Composition, Raw Materials, Manufacture, Testing and Analysis. 2nd Ed. Easton, Pa.: The Chemical Publishing Co. 512 pp. \$5.00.

Coating cement with celluloid. F. C. RUPPEL. U. S. 1,379,837, May 31. A sheet of celluloid is attached to the surface of concrete tiles or other concrete bodies by an intermediate layer of fibrous fabric, e. g., cheese cloth.

Oxychloride cement. G. M. FORMBY. U. S. 1,379,680, May 31. A mixt. of $\text{Ca}(\text{OH})_2$ and $\text{Mg}(\text{OH})_2$ is treated with HCl and the product thus obtained is added to portland or other cements in order to harden and strengthen them.

Asphalt-cement mixture adapted for use in sheet form. A. L. CLAPP. U. S. 1,379,590, May 24. A pliable, H_2O -repellent mixt. which is non-adhesive at ordinary temp. and which is adapted for rolling into sheets is formed of asphalt 600, clay 50 and portland cement 350 parts, mixed with sawdust or other fiber.

Controlling the setting of cements. C. L. NORTON. U. S. 1,379,204, May 24. Shingles or like articles in thin sheets are formed with hydraulic cement and during their setting are confined between two opposite restraining surfaces which may be formed of other shingles stacked together while their edges are surrounded by an atm. of 90% humidity in order to prevent unequal drying. The shingles may be formed of asbestos 25 and cement 75%.

Asphalt mixture adapted for paving, etc. E. L. SHARPNECK. U. S. 1,379,052, May 24. A plastic mixt. adapted for paving or manuf. of building blocks is formed of finely divided filler such as earth or sand 73-86%, mineral asphaltum 8-20%, pulverized borax 1-2.5% and portland cement 5%. U. S. 1,397,053 relates to a similar mixt. in which MgCl_2 is used instead of borax.

Removing discolorations from masonry. D. CADIAUX. U. S. 1,380,634, June 7. Brick or stone is freed from discoloration by successive treatment with HCl soln. or other inorg. acid and glycerol mixed with oils of citronella and sassafras.

Heating cement kilns. W. E. SNYDER. U. S. 1,381,026, June 7. Fuel is economized in heating rotary cement kilns by preheating the air supplied to the kiln by passing it through a chamber surrounding the kiln and connected with it at one end.

Increasing the strength of wood. S. SMITH. U. S. 1,380,429, June 7. Wood is strengthened and enabled to withstand high temps. by treating it with an enamel coating and then gradually heating the treated wood to a temp. of about 90°. The heating may extend over a period of about 4 hrs. and the method is especially suitable for treating maple or other wood coated with "Standard grip enamel."

21—FUELS, GAS, TAR AND COKE

A. C. FIELDNER

Powdered fuel. J. BIBBY, *et al.* *Electrician* 87, 181-2(1921).—A general discussion (pro and con) of powdered fuel for steam boilers, Cu smelting, etc. C. G. F.

Coal research: Its aims and results to date. FRANZ FISCHER. *Elektrotechn. Z.* 42, 809-14(1921).—8 illus. An address. The subject matter is treated under the following heads: Origin and chem. structure of coal; complete chem. utilization of coal (treatment with O_2 ; O_2 under pressure; H_2 under pressure, Fischer process, Bergius process, etc.); recovery of chem. by-products before utilization as fuel; electrochem. combustion (Baur-Treadwell cell). Also in *Brinnoft Chem.* 2, 229-37(1921). C. G. F.

Investigation of the brown coal of Bosnia as to its suitability for preparation of tar. GWOSDZ. *Feuerungstechnik* 9, 165-8(1921).—This study is principally concerned with that tar which gives rise to aliphatic compds. The yield of tar varied from 7 to 11%, depending upon the source of coal. Worked up according to Fischer's method, one tar gave the following products: phenol (volatile), 3.4%; cresol (not volatile), 17.0%; volatile bases, 0.6%; non-volatile bases, 1.5%; asphalt-like material, 31.2%; paraffin, 6.4%; volatile neutral oil, 15.0%; lubricating oil, 24.4%; loss, 0.7%. Data are given for 3 coals. C. J. WEST

Spontaneous combustion of coal in mines. R. A. S. REDMAYNE, *et al.* *Iron and Coal Trades Rev.* 103, 225-31(1921); *Gas J.* 155, 373(1921).—Final report of the Comm. to investigate spontaneous combustion and means for preventing it. *Conclusions.* (1) Self-heating of coal is not in any way due to the presence of bacteria. (2) Some small amt. of heat may in certain cases be developed by oxidation of pyrites but the effect of this heat is negligible. (3) Presence of moisture has an accelerating effect on oxidation. (4) Self-heating of coal is mainly due to the absorption of O resulting in the generation of heat. (5) This absorption, in so far as heating effects are concerned, is a chemical and not a physical process. It is mainly the attachment of O to molecules of high C content. The chemical interaction between the O thus loosely held by the C-like molecules and other atoms in these molecules or other portions of the coal conglomerate plays an important part in detg. actual spontaneous ignition of coal. (6) From the chemical standpoint, the higher the % of O contained in the coal, the greater is the liability of spontaneous combustion. (7) The temp. of the coal is important, and the more permeable the coal, the greater the effects of oxidation. (8) As the temp. rises, the rate of absorption of O increases. Probably all bituminous coal is liable to spontaneous combustion in some degree, but the varying liability of different coals to spontaneous combustion is due to several physical, rather than chemical, causes. These are enumerated and recommendations made. Also in *Chem. Age* (London) 5, 208(1921). L. J. WILEY

The importance of coal analysis in coal chemistry. HUGO STRACHE. Tech. High School, Vienna. *Z. angew. Chem.* 34, Aufsatzteil, 332-3(1921).—Elementary analysis of coal is still of great value (*J. Gasbel.* 1919, 106). Recently, however, the development of the coke and tar industries has necessitated further data. Numerous references are made to recent methods and app. for this field of analysis. (Jüptner, *Die Heizgase der Technik*, 1920; Grafe, *Laboratoriumsbuch für die Braunkohlenzeiterindustrie*, 1908; Hiller, *Eine neue Form der Kohlenuntersuchung nach Strache*, C. A. 10, 3150; Strache and Dolch, *Zusammensetzung von Braunkohlenzeeren*, *Montanistische Rundschau* 13-9 (1919) and C. A. 14, 3149 and 3521). C. C. DAVIS

Carbonization of coal at low temperature. JOHN ROBERTS. *Iron and Coal Trades Rev.* 103, 193-6(1921); *Gas World* 75, 129-31(1921); 13 figs.—It is shown that semi-coke of a suitable degree of hardness, density and toughness can be produced in the lab. by pre-treating the coal before carbonization, the preliminary treatment also serving to increase the heat cond. of the charge while at the same time preventing expansion and increasing the crushing strength. The desired result can be obtained with small or large charges, the form of the retort having little influence on the quality of the product. It is predicted that semi-coke can and will be produced in bulk by carbonization in

coke ovens and in gas retorts, with standard plant. The principle of the pre-treatment consists in mixing with the coal high-temp. coke or pulverized coke breeze in suitable proportions which must be detd. by lab. tests for any given coal. Also in *Gas World* 75, No. 1937(Coking and By-products Sec.), 17-20(1921). J. L. WILEY

Vegetable oils as engine fuel. G. H. FORD. *Cotton Oil Press* 5, No. 1, 38(1921).—A summary of the Belgian Govt. expts. with palm and other vegetable oils in a semi-Diesel engine. Palm oil proved better than peanut or cottonseed oils. A standard make of engine with a special carburetor and equipment for automatically feeding the oil in proportion to the load worked satisfactorily with palm oil. If palm oil can be economically used in the tropics where it is produced the price of other vegetable oils may be enhanced owing to less competition. H. S. BAILEY

Palm oil as motor fuel. I. LAZENNEC. *Industrie chimique* 8, 262(1921).—Palm oil can be used as fuel in explosion motors. It is actually being used by the Société Anglo-Belge de Constructions Navales in 10, 25 and 50 h.p. semi-Diesel motors, and by the "Omnium Africain" in Drott semi-Diesel motors. The consumption is about 20% greater than for petroleum oils, owing to the difference in calorific value. It is necessary to start up the motor with a petroleum oil, and also before stopping it is necessary to run it on petroleum sufficiently long to clear it completely of palm oil which would solidify on cooling. A. P. C.

Present position of smokeless fuels. F. S. SINNATT. *Gas J.* 155, 385-6(1921); *Iron and Coal Trades Rev.* 103, 233(1921).—The industry is at present in its infancy and to a large extent still in the exptl. stage, but some of the processes give promise of becoming large industrial processes. It is desirable that the manuf. of smokeless fuel be undertaken as it would solve the problems of fuel conservation, air pollution and efficient domestic heating. The following types of smokeless fuels are discussed briefly and chem. analyses given: Low-Temp. Carbonization Fuel, Tarless Fuel (Tozer patent), Carbocoal, Lignite Utilization Board Briquets (Canada), Coke Briquets (Sun Fuel Co.), and J. Hargreaves Low-Temp. Coke. The latter is obtained in a modified coke oven and is an excellent smokeless fuel containing 12% volatile matter. Also in *J. Roy. Sanitary Inst.* 42, No. 1; *Chem. News* 123, 109-11(1921). J. L. W.

Extinguishing coal fires. IMMERSCHITT. *Feuerungstechnik* 9, 145-9(1921).—Water, gases to replace the O, such as CO_2 , SO_2 and NH_3 , and salt solns. as NaHCO_3 and $(\text{NH}_4)_2\text{SO}_4$ are discussed as means of extinguishing fires in coal mines and coal piles. Means of preventing fires are also discussed. C. J. WEST

Carbides in the service of heating. A. GAWALOWSKI. *Feuerungstechnik* 9, 198-9 (1921).—A combination of several carbides (CaC_2 , K_2H_2 , Al_2C_3 , Fe_3C , Mn_3C , V_2C_3 are mentioned but mixts. are not definitely given) gave a gas of elementary compn. C_1H_3 , which, on fractional gas analysis, gave 60% CH_4 , 30-31% C_2H_2 and 8-9% H_2 ; the gas had a heating value of 13,000-14,000 cal. C. J. WEST

The economics of a benzene recovery plant in connection with gas works. CURT PLONAIT. Univ. Königsberg. *Feuerungstechnik* 9, 153-5(1921).—The economics of C_6H_6 recovery from gas works is a function of the size of the works and the yield of the gas; a scheme is given for calcg. this. C. J. WEST

Sulfur removal by oil washing. E. R. HAMILTON. *Am. Gas. J.* 115, 182-3(1921); *Gas Age-Record* 48, 248-50(1920).—Results obtained at Halifax (cf. *C. A.* 14, 3146). The method has proved feasible and for a small plant compares favorably with any of the more elaborate systems. The temp. control is the chief problem as the temp. must be kept down owing to the high vapor tension of CS_2 . The best operating condition is at 60° F. or under and within 1 or 2 degrees for both oil and gas. Coils have been installed in the scrubbers for heating in cold weather and cooling in warm weather. Towers with wooden grids are used, part of the grids being replaced by layers of excelsior to in-

crease the scrubbing area. The oil used is refined from a paraffin base crude and is known as "pale paraffin oil." Its f. p. is 26° F. and it does not easily emulsify. The wash oil is distd. in the dehydrating and dephlegmating column of the tar still. Steam at 127 lb. pressure is used on the coils in addition to the small amt. of live steam admitted. Distillates up to 140° are given off as well as CS₂. About ½ gal. of benzene per ton of coal is obtained. The S content of the gas varies from 35 to 160 g. per 100 cu. ft. The reduction has been from 5 g. on the first to 60 g. on the latter with an av. flow of oil of 4.5 gal. per 1000 cu. ft. of gas. The av. expuse per 1000 cu. ft. for June was 3.34 cents, about one-half of which was due to oil losses, offset by 1.53 cents per 1000 cu. ft. for benzene. Analysis of the wash oil by the combustion method with Na₂O₂ to det. the increase in S has shown 0.303% S in the fresh oil, 0.347% in the redistd. oil, and 0.432% in the satd. oil. J. L. WILEY

Vaporization of paraffin in coal gas. NORMAN SWINDIN. *Gas J.* 155, 266-9 (1921); 12 figs.—To prevent naphthalene from depositing in gas mains, after removal of the hydrocarbons from the gas, paraffin oil is often sprayed into the gas stream to hold the naphthalene in suspension. The vaporization of paraffin oil at ordinary temps. is difficult, however, in that it will not vaporize in the presence of satd. water vapor at any temp., and if the temp. is raised in order to increase the satn. point of the water vapor in the gas and to leave room for the paraffin vapor, on cooling to the temp. of the mains, the satn. point of the water vapor is brought down and the oil vapor is deposited. The only real method, then, of vaporizing paraffin oil permanently in the gas is based, first, on the removal of the water vapor by some form of dryer, and second on the passage of this dried gas over large surfaces of oil in films at normal temp. S. has devized an app. involving these principles (cf. *C. A.* 11, 3421). Dry coal gas of av. compn. will absorb as vapor about 18 gal. of oil per million cu. ft. at normal temps. It is, therefore, useless to vaporize more than this amt. of oil by raising the temp. of either the gas or the oil, because on cooling to 60° F., the excess oil is deposited and lost. J. L. WILEY

Use of niter cake for making sulfate of ammonia. W. H. H. NORRIS. *Iron and Coal Trades Rev.* 102, 638 (1921).—Abstr. Niter cake can be used for NH₃ absorption, producing (NH₄)₂SO₄ and Na₂SO₄, suitable for glass-making. 220 tons of niter cake will produce 157 tons of satd. cake and 87 tons of (NH₄)₂SO₄. The method can be used with the Mond Gas NH₃ recovery plant, with NH₃ absorption towers and dasher washers, or in the ordinary saturator as employed on coke-oven and gas plants. The operation works up all of its own waste liquors, and requires the minimum of handling and evapn. The niter cake is digested with hot-process liquor and the whole of its contents of salt cake is pptd. in a pure form, while all the acid is taken into soln. The mixt. is filtered and washed in centrifugals and the acid liquor resulting used for NH₃ absorption. The neutralized liquor is evapd. for the deposition of (NH₄)₂SO₄ contg. over 24% free NH₃, but concn. is checked when a definite density is reached and the process liquor run back to the digester. The residue from the retort can be run off and pelleted in the digester in presence of liquors of a regulated compn. A second liquor treatment in the same vessel produces pure anhydrous Na₂SO₄ (96%) corresponding to 43% of the original salt cake content. The acid liquor represents over 60% strength. It can be dild. for transit to about 25% acidity with no danger of crystg. out on cooling to 10°. J. L. WILEY

Purification by oxide of iron. T. LEWIS BAILEY. *Gas World* 75, 110-13 (1921).—See *C. A.* 13, 3199. J. L. WILEY

Report of the life of gas-meters joint committee. J. G. TAPLAY. *Gas. J.* 155, 377-81 (1921).—The work discussed in the report for 1920 (*C. A.* 14, 2411) has been continued. SO₂ is particularly considered. Blue water gas may easily be a cause of trouble if it has an acid reaction. It should be passed through an alk. washing soln.

Carbureted water gas is only neutral when the flue gas is carbureted to the extent of 1.5 to 2 gal. of oil per 1000 cu. ft. Even then, it depends upon the amt. of S both in the coke and the oil. The oxide used for purification should have an alk. reaction, and artificial oxide should be used only after careful analysis, as it often contains detrimental S compds. As regards the removal of HCN, it is stated that a promising method has given excellent results in the lab. tests, and will be reported later. In the spraying of meters, experience has shown that the best oil for the purpose is a mineral oil of high b. p., with a sp. gr. of not less than 0.85 which will not ultimately leave a gummy residue. Also in *Engineering* 112, 342(1921).

J. L. WILEY

Gas-producer practice. N. R. REES. *Iron and Coal Trades Rev.* 102, 636-7 (1921).—Efficient and economic working of a producer requires an even distribution of fuel, uniform and continuous production of good quality gas, regulation of depth of fuel bed to obtain as complete reduction as possible of CO_2 to CO and the decomprn. of the steam, removal of ashes and clinker in as simple a manner as possible, and low cost of operating and installation with quick and efficient gasification. The temp. of the combustion zone should never go below 1125°, except for low-grade coals whose ash fuses and clinkers easily. Regular feeding must be practiced in order to obtain regular and uniform production of gas and to avoid fuel waste. Channeling in the fuel bed must be prevented by systematic poking, unless mechanically done, otherwise, the CO₂ content becomes undesirably high, a large amt. of heat is wasted and clinkering occurs. Also ash removal must be carried out systematically and thoroughly, particularly with water-sealed producers. The reason is self-evident. The depth of fuel bed to be carried depends upon the nature of the fuel as regards its coking power and size and the m. p. of the ash, the type of blower, rate of gasification, method of agitation of the fuel bed, and method of removing ashes. Generally, 18 to 30 in. of incandescent zone and 9 in. of distn. zone are correct. A fair av. capacity for a producer is 25 lbs. of fuel per sq. ft. of grate area. Fuel of the highest heating power is best, for the use of lower grades means higher initial plant cost, more labor charges, greater loss of combustible in the ash, and greater difficulty in operating. Semi-bituminous coals, 20% volatile, work satisfactorily. Strongly caking coals are objectionable, but free-burning coking coals give good results. Fuel graded to nut size is preferable. Fine, dusty fuels should be avoided as they pack the fuel bed, stop-up the flues and regenerators, and increase the CO₂ in the gas by forcing the blast to the walls instead of through the incandescent fuel. The amt. of steam required can generally be taken at 0.35 lb. per lb. of coal. The pressure varies from 47 lb. with a $\frac{3}{16}$ in. nozzle to 54 lb. with a $\frac{1}{4}$ in. nozzle. The use of slagging producers is acquiring considerable consideration.

J. L. WILEY

"Remainderless" gasification process. J. BUIJS. *Het Gas; Gas Age-Record* 48, 205-6(1921); 1 fig.—The Rincker-Wolter complete gasification plant at the Utrecht gas works consists of two water-gas generators placed side by side; alternately in one of them water gas is made from coke and in the other bituminous coal is gasified, then the order is reversed. By this process for 3 months, 9000 cu. m. of gas per day was made with a consumption of 58.7 kg. coal per 100 cu. m., also 8.8 kg. coke per 100 cu. m. in starting the generator and about 30 kg. of boiler fuel. The efficiency of the former retort carbonization and water-gas generation was 46%, of this process 57.5%. Were the steam generated in waste heat boilers, the efficiency would be 52.5 and 68.5, resp. A typical analysis of the mixed gas shows: CO₂ 4.4, H₂ 43.4, N₂ 10.1, C₂H₂ 0.1, CO 36.4, O₂ 0.1, CH₄ 5.5, B.t.u. 2970.

J. L. WILEY

Management and repair of furnaces in small gas-works. CHANGARNIER. Soc. Tech. du Gaz. *Gas J.* 155, 270-2, 327-8, 384-5(1921).—Results of practical experience.

J. L. WILEY

The automatic calorimeter and the registering gas balance as modern control apparatus in gas factories. A. HOFFMANN. Hamburg. *Feuerungstechnik* 9, 186-9 (1921).—Description, with illustrations, of Junkers' registering calorimeter and Lux's self-registering gas balance.

C. J. WEST

The self-registering determination of the heating value of gases. E. HEER. *Feuerungstechnik* 9, 155-7 (1921).—Description of the Junkers' calorimeter. C. J. W.

Measures for abating the smoke nuisance. DAUDE. *Deut. Zuckerind.* 46, 328-9 (1921).—A digest of German patents.

F. W. ZERBAN

Low-temperature tar production and the gas industry. BUNTE. *Brennstoff Chem.* 2, 202 (1921).—Before the war Germany imported 275,000 tons (metric) of gasoline annually; if this were to be replaced by low-temp. tar distillate, 14 million tons of suitable coal would be required, 9-10 million tons of half-coke ("coalite") would have to find a market and 500,000 tons of higher phenols would require new outlets. The scarcity of lubricating oils has decreased since the war and the gas industry has not yet worked out the best technical utilization of the distn. gases and the half-coke. For these reasons B. decries optimism as to the immediate substitution of coal distillates for gasoline.

W. B. V.

Sources of tar in Saxon-Thuringian lignites. E. ERDMANN. Halle. *Z. angew. Chem.* 34, Aufsatzteil, 309-14 (1921).—Samples of certain lignites (Schwelkohle) were analyzed for bitumen, humic acids, org. ingredients insol. in ordinary solvents and inorg. residue. Data for these are given. After extn. for bitumen and humic acids, the residue was inflammable in O_2 containing 2% O_3 . Hard coal is probably formed from lignite by high temps. and pressures, and since there are no humic acids in hard coal it is concluded that the humic acids are destroyed by the high temps. below the surface of the earth. Humic acids decom. at 225-30° to form CO_2 and CH_4 , often found in hard coal, and at higher temps. form phenols and tar. The humic acids were judged to be derived from lignin, for each gives phenols and pyrocatechol on distn. (cf. *C. A.* 15, 83). No cellulose was detected.

C. C. DAVIS

Production of crude tar from peat. GUSTAV KEPPELER. Hannover. *Z. angew. Chem.* 34, Aufsatzteil, 327-9 (1921).—The distn. of peat for tar is still relatively unimportant. This article deals with the yields and analysis of tar and the methods and recent com. ovens for coking (German Patents 103507, 104482, 158032, 176365, 176564 and Franke-Tern. *Mitt. Ver. z. Förderung d. Moorkultur* 156 (1919)). C. C. DAVIS

Composition of high- and low-temperature tars. J. MARCUSSON AND M. PICARD. *Z. angew. Chem.* 34, Aufsatzteil, 201-4 (1921).—The following types of tar were investigated: low-temp. anthracite tar (A), lignite tar (B), wood tar (C), oil gas tar (D), and neutral gas tar (E). The tars were saponified with alc. KOH, and the hydrocarbons and neutral compds. sepd. Of these A contained 65.5%, B 80-90%, C (2 kinds) 18% and 53.5%, D 83%, and E 81.2%. The saponifiable constituents of A differed materially from those of ordinary high-temp. tar; the latter contains no carboxylic acids, while A contained 12%; there were also other differences. The acids in A were found to be aromatic, and were investigated in detail. B contained 2.4-4.5% of carboxylic acids, which were not examd. further. In addition to paraffins, the unsaponifiable portion of B was found to contain unsatd. hydrocarbons, alcs., bases, and ketones; the presence of the latter may be due to a reaction similar to that described by Grün and Wirth (*C. A.* 14, 3672) (dry distn. of Na stearate). Wood tar was found to vary considerably according to the kind of tree (deciduous or evergreen). The former are much lower in unsaponifiable material and much higher in acids or acid derivs. (61% as compared with 14%); the acids are present mostly as esters. The saponifiable portion of D consists mostly of resins sol. in C_6H_6 and $CHCl_3$; on distn. 40% passes over below

250° and 50% above 250°. The compn. of *E* is very similar to that of *D* except that there is a much larger residue on distn.

DONALD W. MACARDLE

Remarks on the article by Marcusson and Picard on "Composition of high- and low-temperature tars." AD. GRÜN. *Z. angew. Chem.* 34, Aufsatzeil, 355-6(1921).—(See preceding abstract). G. states that M. and P. are in error in the conclusion which they drew from his paper on the genesis of petroleum. In this paper G. stated that free fatty acids, either as vapor or as liquid, were by suitable catalysts transformed to ketones; this change and the subsequent change to hydrocarbons both take place better under pressure than *in vacuo*. M. and P. assume that the dry distn. of Na salts of fatty acids under the given conditions yield ketones, which according to G. is not the case.

D. W. MACARDLE

Electrical precipitation of tar fog. G. E. FOXWELL. *Gas World* 75, No. 1933, (Coking and By-products Sec.) 12-13(1921).—The theory of the process is given. It probably has no advantages where the indirect or semi-direct processes are employed. Its immediate application is with the hot process in connection with which it is valuable as it also ppts. the water fog. Indication is made that it may also aid in solving the S problem, since the reaction between H₂S and SO₂ may be influenced and the S ppts.

J. L. WILEY

Automatic control of combustion in steam boilers. G. FRERÉ. *Soc. Tech. du Gaz. Gas J.* 155, 270(1921); 1 fig.—The system, devised by F., consists essentially of a steam-measuring device, a fan working at substantially const. pressure, and a regulator of the air supply to the fan. The heat carried off by the steam and requiring to be immediately replaced is used as the basis of the regulation. Combustion is improved, the spent gases containing from 9-13% of CO₂, and the steam pressure does not vary more than 5-7%. A fuel economy of 18.4% was found by official tests.

J. L. WILEY

New coke oven and by-product plant at the Acklam Works of the North-Eastern Steel Co. Ltd. ANON. *Iron Coal Trades Rev.* 103, 161-3(1921); illus.—The plant consists of 60 vertical-flued, regenerative, Simon-Carves ovens, and complete equipment for recovery and manuf. of tar, (NH₄)₂SO₄, crude benzene and naphthalene. Durham coal is used from which the following approx. yields of products are obtained: coke 75%, surplus gas 50% or 2½ million cu. ft. per day, tar 72 lbs., (NH₄)₂SO₄ 24 lbs., naphthalene 8 lbs., crude benzene 2.5 gal. per ton of coal.

J. L. WILEY

Piron by-product coke ovens. ANON. *Iron Age* 107, 1531-3(1921).—These ovens (Piron, U. S. pat. 1,806,023, C. A. 14, 463), of which 12 are in operation in Alabama as a demonstration unit, are figured and described. The P. oven varies in some ways from standard practice, but has been found in a year's trial to give satisfactory and efficient results. The yield of by-products has not been checked up, as the gas from the P. ovens was mixed with gas from other ovens before cooling, but indications are that the yield and quality of the gas will be equal to that of other ovens. Advantage is claimed for the P. oven in economy of construction and operation.

D. W. M.

Ferro-concrete in the construction of by-product coke-oven plants. ANON. *Gas World* 75, No. 1933 (Coking and By-products Sec.), 14-15(1921); *Iron and Coal Trades Rev.* 103, 197(1921).—The advantages of ferro-concrete in coke-oven plant construction are: it requires no up-keep, it is not affected by the gases and vapors, and tanks are water-tight and liquid does not affect the cement as it does iron and steel. The greatest disadvantage is that alterations are practically impossible. Its application to washeries, oven structures, storage tanks, by-product buildings, etc., is shown. It is stated that coke-oven doors, lined with refractory material, are suitable.

J. L. WILEY

Boiler furnace construction according to Bergmans (BREIDENBACH) 1. New

methods for the utilization of coal (BERGIUS) 22. Report of the Refractory Materials Research Committee to the Institution of Gas Engineers (BRADSHAW, EMERY) 19. Manufacture of gas-clinker brick at the Wurzburg Gas Plant (GREINEDER) 19. Industrial electroosmosis (ROWLINSON) 4. Determination of the combustibles in gas mixtures (KALETA) 1.

DIETERICH, KARL: *Die Analyse der Kraftstoffe*. Helfenberg bei Dresden. Verlag Chemische Fabrik Helfenberg. 298 pp. For review see *Brennstoff-Chem.* 2, 112 (1921).

GEIPERT: *Der Betrieb von Generatoröfen*. Munich: R. Oldenbourg. Kart. M 13.

HERMANNS, H.: *Vergasung und Gaserzeuger*. Halle: Verlag Wilhelm Knapp. M 38.80, bound 43.30+. For review see *Arch. Wärme- und Dampfkesselwirtschaft* 2, 86 (1921).

NUBER, FRIEDRICH: *Wärmetechnische Berechnung der Feuerungs- und Dampfkessel Anlagen*. Munich and Berlin: Verlag R. Oldenbourg. M 12.

WIRZ, AIMÉ: *Les gazogenes et l'économie du combustible*. Paris: Librairie J. B. Bailliére et fils, 19 rue Hautefeuille. For review see *Bull. soc. ind. Rouen* 49, 187 (1921).

Storing liquid fuel on ships. L. W. BATES. U. S. 1,379,241, May 24. Mobile fuels such as mixts. of hydrocarbon oils and colloidal C when carried on ships are rendered less susceptible to ignition from shell or torpedo fire by maintaining them in storage in a congealed state induced by refrigeration.

Fuel gas from heavy hydrocarbons. H. BLUMENBERG, Jr. U. S. 1,379,077, May 24. Electrolytically generated H and O are passed through heavy hydrocarbons such as kerosene or engine distillate in order to produce a gaseous fuel mixt. adapted for use in internal-combustion engines.

Blended motor-fuel. A. HAYES. U. S. 1,378,858, May 24. A stable non-stratifying motor-fuel is prep'd. by adding ether to kerosene and then successively adding C₆H₆ and alc.

Water-gas. W. W. ODELL. U. S. 1,379,038, May 24. Gas is made from bituminous coal or similar fuel by first heating a bed of ignited fuel in a generator by blasting it with air, using an up blast only from beneath the fuel bed, together with a small amt. of steam which is introduced during the first portion of the blast period only for the prevention of smoke, the blast being prolonged thoroughly to heat the upper zones of the fuel bed. When the air and steam are shut off, up-and-down runs are made, a small amt. of air being used with the steam injected to prolong the runs. At least two up-runs are made for every down-run.

Gas purification. H. F. SMITH. U. S. 1,379,056, May 24. Coal gas or the like is purified by passing the gas through a diaphragm which may be formed of spun glass or hair, while varying the density of the diaphragm by varying compression in order to keep substantially const. the differential pressure on opposite sides of the diaphragm.

Gas-purifying composition. H. C. MARRIS. U. S. 1,379,462, May 24. A gas-purifying material is prep'd. by pptn. of an Fe compd. on a fibrous cellular carrier such as spent tan bark, e. g., by the interaction of a soln. of FeSO₄ or FeCl₃ and spent lime from tanneries.

Gas producer. A. H. LYNN, L. A. RILEY and N. E. RAMBUSH. U. S. 1,380,993, June 7.

Gas producer. J. WELLS. U. S. 1,380,278, May 31.

22—PETROLEUM, ASPHALT AND WOOD PRODUCTS

F. M. ROGERS

The nomenclature of petroleum products. F. BORDAS. Chief of the Labs. of the (Fr.) Dept. of Finance. *Ann. faits.* 13, 89–93 (1920).—A discussion of the terms used to designate various petroleum products, with a plea for the unification or standardization of these terms or for the adoption of specifications which would give better classification and differentiation of the various products.

A. P.-C.

Refractive index of Roumanian petroleums. CR. PREDESCU. *Bull. sec. sci. acad. Roumaine* 6, 150–6 (19–20).—The ds. and refractive indexes of two kinds of Roumanian oil (Câmpina, d_{40}° 0.8671 and 0.8750, dark non-paraffin crudes) and of the 10° fractions between 50 and 310° were detd. The n_s were measured at 15°, monochromatic light (Na) being used. For the dark colored crudes and the residuum, the method of polarized light with Brewsterian incidence was employed. Tables present the complete results, including sp. refractive index according to the formula of Gladstone and that of Lorentz-Lorenz. The n of the lighter crude is 1.487, while the values for the fractions increase from 1.384 to 1.526. After 16 months, the d. and n of each of the samples, which were contained in bottles closed with stoppers in the usual manner and stored in a half-dark room, were measured. As a result of resinification due to polymerization, and of evapn. both values had increased slightly for each sample. The sp. n_s increase very slightly with increasing b. p. of the fractions. W. F. FARAGHER

Specific inductive capacity of Roumanian petroleums. CR. PREDESCU. *Bull. sec. sci. acad. Roumaine* 6, 156–9 (19–20).—The diclce. consts. (K) of 2 crude oils from Campina and of certain of their fractions (see preceding abstr.) were detd. by the method of Nernst (*Z. physik. Chem.* 1894, No. 14). The value found for the lighter crude oil is 2.124. Values for certain other petroleum products of Roumanian origin are included in the table of results. The law of Maxwell ($K = n^2$) holds closely for all of these products.

W. F. FARAGHER

Method for determining the density of residuum (petroleum). CR. PREDESCU. *Bull. sec. sci. acad. Roumaine* 6, 148–50 (19–20).—A small sample of the “semi-solid” material (1.0 g.) is made to adhere to the wall of a piconometer. The usual method for solid materials is then followed.

W. F. FARAGHER

Development of an oil by-product industry. ERIC K. RIDEAL. *Chem. Age* (London) 4, 666–8 (1921).—Very little work has been done on the character of the O compds. in crude oil. R. has isolated small percentages of fatty acids, principally adipic acid, from the oil sands of Baku, which indicates that some fractional oxidation has been effected at moderate temp., probably as a result of the catalytic influence of the sands. A soln. of the problem of removing S economically would make the oil industry self-supporting in respect to H_2SO_4 . Although the av. N content of crude oils does not greatly exceed that of coal, the yield of NH_3 from oil should be much greater than that from the former. In those cases where the N can be extd. as salts of N bases, and the salts recovered from the acid sludge, the production of NH_4 by catalytic decompn. of these bases is both efficient and easy. Production of $HCHO$ and $MeOH$ from natural gas seems to be practicable. The work of Bone is cited in which the oxidation of CH_4 by air was effected at 800° on the surface of beads of borosilicate glass. A brief discussion is included of the oxidation of paraffin wax to fatty acids and alcs. W. F. FARAGHER

Manufacture of motor spirit by cracking processes. ANON. *Chem. Age* (London) 4, 578–80 (1921).—Brief outlines of several processes which are being used commercially. The production of satd., low-boiling hydrocarbons from petroleum distillates should be effected in 2 stages: cracking proper, which produces low-boiling, unsatd. hydro-

carbons; and hydrogenation, which yields the desired satd. compds. It is stated that vapor-phase hydrogenation is unlikely to cause any great difficulty in practice.

W. F. FARAGHER

Benzine from heavy hydrocarbons. R. VON WALThER. Freiburg. *Z. angew. Chem.* 34, Aufsatzteil, 329-32(1921).—A semi-popular presentation, historical and descriptive, of the (1) isolation of gasoline from natural gas; (2) the development of the cracking processes; (3) the methods of distn. under high pressures and (4) the splitting of heavy oils by means of catalysts.

C. C. DAVIS

The natural hydrocarbons gilsonite, elaterite, wurtzilite, grahamite, ozocerite, and others. RAYMOND B. LADOO. Bur. of Mines, *Repts. of Investigations* No. 2121, 12 pp.(1920).—Definitions are given of certain terms used in the literature of bitumens, and of the products enumerated in the title. A discussion of the production, yield, etc., is given for some of the products. A bibliography is appended.

W. F. F.

"Lightened" gasolines. F. BORDAS. *Ann. fals.* 13, 539-43(1920).—"Lightened" gasolines are mixts. of straight-run and casing-head gasolines. B. considers that by dissolving non-condensable gases in a relatively heavy oil (which is essentially the process for making casing-head gasoline), the d. of the oils is lowered, thereby masking their presence, which, under ordinary conditions, makes proper carburation more difficult. It also greatly increases explosion and fire hazards. He considers that the addition of casing-head gasoline without declaration constitutes a fraud, as it gives a factitious lowering of the d. The official French method of analysis must be somewhat modified when casing-head gasoline is present (the modification as described is not very intelligible without the description of the official method). To det. the amt. of dissolved gases (which may reach 10% and even more), about 200 cc. of the sample are placed in a round-bottomed 300-cc. flask connected to a 1 meter reflux Liebig condenser, which is connected to a glass tube about 80 cm. long which dips into a graduate containing 50 cc. of petroleum and surrounded by melting ice or by a freezing mixt. The gasoline is kept at a temp. near its b. p. for about 30-45 min., the graduate is then allowed to come up to room temp., and the increase in vol. is equal to the vol. of the gases dissolved in the gasoline. The increase in d. due to the elimination of the gases from the gasoline is usually of the order of 0.010.

A. P.-C.

New methods for the utilization of mineral oils and coal. FRIEDRICH BERGUS. *Z. angew. Chem.* 34, A:ufsatzteil, 341-7(1921).—The application of new products from mineral oil and coal to industry and the arts is explained. At present 3 problems are paramount: (1) a new source of supply of gasoline; (2) the utilization of heavy asphaltic oils, probably by conversion into light oils; and (3) the creation of large supplies of oil by conversion of coal into oil. The cracking process is regarded as the best present day soln. of (1). Both (1) and (2), with their app. are described in great detail with diagrams and graphs. By hydrogenation of asphalts (2) is now being successfully solved, and vast sources of supply of asphalts offer a source of all grades of oil. (3) is still in a semi-experimental stage owing to the war (cf. German pat. 301,231).

C. C. D.

Oil refining in Russia. ANON. *Petroleum World* 18, 269-79(1921).—Most of the Russian crudes are good for treatment for kerosene and gasoline but those from which lubricating oils are to be produced are comparatively not abundant while those from which vaseline and paraffin may be produced are even less plentiful. Recently the production of paraffinic oils in the new Grozny oil fields is gradually but largely increasing so that in all probability such oils will attain a predominant position in the near future. The actual process of refining the oils consists of distn. and the usual treatment with H_2SO_4 and alkali. Any cracking or decomposition is avoided and to this is due the great advantage that Russian lubricating oils have on the market. Each battery of stills consists of 10 to 15 stills and each still has a capacity of 20 to 25 tons of crude oil.

The oil is distd. at atmospheric pressure or under a vacuum and gasoline and kerosene fractions are obtained. The final temp. in the last still is about 270–280° and the distillates received are separated into a gasoline fraction (sp. gr. 0.770 to 0.798) and a kerosene fraction (sp. gr. 0.799 to 0.832, flash 28°). The residues (ostatki or mazout) have a sp. gr. of about 0.905 to 0.910 and a flash of not less than 80°. These residues are usually distd. under a vacuum and yield the various grades of spindle, machine, cylinder and various other grades of lubricating oils. The residues from the production of lubricating oils is usually termed "goudron" and is mixed with residues from the kerosene manufacture and used as a fuel. If the aromatic hydrocarbons are to be extd. from the oil then the crude oil is treated in apparatus similar to that used in manufacturing gas from coal. A naphthenic gas (up to 60%) is received which is used exclusively as fuel while the condensable hydrocarbons are used in the usual ways.

R. L. SIBLEY

Montan wax and a new method for determining the acid number and saponification number of dark colored oils, fats and waxes. P. PSCHORR, J. K. PFAFF AND W. BERNDT. Tech. High School, Berlin. *Z. angew. Chem.* 34, Aufsatzteil, 334 6 (1921).—An investigation of montan wax from Central German lignite previously described (*C. A.* 15, 1310).

C. C. DAVIS

The McMurray tar sands of Alberta. ANON. *Petroleum Times* 6, 104 (1921).—The tar sands are a great thickness of sandstone completely satd. with oil. Analysis of a sample of cracked asphaltic oil indicates the proportion of commercial constituents to be as follows: gasoline 14.0%, kerosene 45%, light lubricants 28.5%, medium lubricants 8%. In a demonstration plant, 2 oz. of oil were extd. from 1 lb. of sand by heat.

R. L. SIBLEY

Present status of American oil shale development. M. J. GAVIN, H. H. HILL AND W. E. PERDEW. *Chem. Age* (N. Y.) 29, 305–10 (1921).

E. H.

Shale oil. ADOLF SPIEGEL. Darmstadt. *Z. angew. Chem.* 34, Aufsatzteil, 321–7 (1921).—A presentation of the chief points of interest in the shale oil industry. Its origin in nature, its occurrence, its compn., the com. app. for distg. shale, and its uses are treated in detail.

C. C. DAVIS

Nature of shale oil obtained from oil-shale assay retort used by the Bureau of Mines. MARTIN J. GAVIN AND LEWIS C. KARRICK. Bur. of Mines, *Repts. of Investigations*, No. 2254, 11 pp. (1921).—The quality of the shale oil produced with the Bur. of Mines retort (Kerrick, *C. A.* 15, 1805), when operated under conditions detd. to be most suitable for producing the highest yields of oil, is shown by distn. analysis to be nearly as good for a shale oil made from shale from Soldier's Summit (Utah), as that of com. Scotch shale oil. Scotch shale gave an oil when retorted in the Bur. of Mines app., which had an analysis very similar to that of the Scotch shale oil produced in a com. plant (Pumperston).

W. F. FARAGHER

Producing oil from shale. N. H. FREEMAN. *Petroleum Times* 6, 151 (1921).—The chief conditions to be observed in obtaining oil from shale are: the shale must be finely divided, temps. must be regulated, the shale should be agitated to prevent trapping the vapors, and the vapors should be removed when educed and not subjected to higher temps. The production of oil from shale is accompanied by the transformation of heavier hydrocarbons into lighter and heavier parts. A Norfolk shale having 27.45% org. volatile matter began distg. oil at 460° F. At 710° F., 41 gals. of oil per ton of shale had been recovered. Above this temp., waxes, tars, and heavy pitches were carried over. It is concluded that any retort operating above 750° F. is not suitable for retorting shales with the recovery of oils as the object and any advance in temp. above 750° F. approaches the gas-producer effect.

R. L. SIBLEY

Flotation oils from shale. J. M. MCCLAVE. *Petroleum Times* 6, 11–12 (1921).—

It has been found that the method of eduction and temp. of treatment are important factors in the production of shale oils for flotation purposes. There are certain cuts that will yield high-grade flotation oils which will produce clean concentrates with a high recovery. Owing to lack of uniformity in retorting processes, the crude shale oil is not satisfactory.

R. L. SIBLEY

De-oiling paraffin. A. SZEKELY. *Sciensiedler-Ztg.* 48, 408-9(1921).—A brief introduction of the 2 types of sweating methods, the "dry" and the "wet" (only the former is in common use), is followed by a description of S.'s method, a combination of the dry and the wet method (patent applied for). A pan with a sieve-bottom and with sides whose upper portion is perforated carries a set of vertical tubes, also perforated in their upper portion. Cold H_2O is run into the app. to cover the bottom; the paraffin magma is run in up to the lower line of perforations and allowed to solidify partly. The cold H_2O is displaced by warm H_2O which raises the paraffin-cake to the perforated portion, and by regulating the temp. the cake is then allowed to sweat, the collecting oil running off through an overflow on top. Simplicity of app., handling and repairing are claimed for the process.

P. ESCHER

Guides to analysis. IX. The interpretation of asphalt analyses. H. J. ROSS-BACHER. *Chem. Bull. (Chicago)* 8, 151-3(1921).—"Asphalt analysis, in its present status, consists principally in the application of a number of empirical tests designed for measuring the consistency of the material, and for detg. its source and the degree of skill exercised in its prepn. Interpretation of such analyses calls for the widest possible familiarity with the technology of the industry, a knowledge of the service record of the various types of materials, and an appreciation of the limits of reproducibility of the tests." The usual tests are enumerated and discussed briefly.

W. F. FARAGHER

Composition of high- and low-temperature tars (MARCUSSEN, PICARD) 21. The problem of the constitution of fossil organic matter and the relation of its solubility in organic solvents at atmospheric pressure and excess pressure to its natural mode of formation (ENGLER, TAUSZ) 2. Calcium chloride method for the determination of water in gasoline (CLIFFORD) 7.

ABRAHAM, HERBERT: *Asphalts and Allied Substances.* 2nd Ed. cor. New York: D. Van Nostrand Co. 583 pp. \$6.00.

GIBBONS, LEE WALLIS: *The Utilization of Hardwood Waste.* New York: H. J. Baker and Bro.

NORTH, S. H.: *The Petroleum Year Book.* London: St. James Press, Limited, 15 Henrietta St. 10s. 6d. net. For review see *Engineering* 112, 183(1921).

Purifying crude petroleum. J. W. BOSTICK and C. H. HOMER. U. S. 1,380,863, June 7. Oil is subjected to sedimentation in a series of shallow tanks to which it successively flows. The oil is heated to a higher temp. in the first tanks than in the last tanks of the system and vapors evolved are condensed.

Chlorinating hydrocarbons. F. SPARR and W. E. MASLAND. U. S. 1,379,367, May 24. Chlorination of satd. hydrocarbons or the like is effected without danger of explosions by absorbing Cl in the hydrocarbon in the dark and then exposing the liquid to the action of actinic rays without permitting overlying gas spaces adjacent the liquid. Any HCl gas which escapes from the liquid during the reaction or subsequently is conducted through a condenser which returns vaporized hydrocarbons and then into an absorption tower with a percolating stream of H_2O to absorb the HCl gas and condense additional hydrocarbons. The HCl soln. thus formed is sprayed through hydrocarbons to cause the latter to take up Cl and HCl.

Chlorinating paraffin hydrocarbons. G. T. KOCH and A. L. STALLKAMP. U. S. 1,380,067, May 31. Chlorination of paraffin hydrocarbons is effected by treating the hydrocarbon with Cl in the liquid phase in the presence of a catalyst, *e. g.*, silica gel, "batchite" or coconut charcoal. The Cl is injected beneath the catalyst so as to effect its mixture with the liquid.

Cracking hydrocarbon oils. J. W. COAST, JR. U. S. 1,379,333, May 24. Wet residual matter in cylindrical oil-cracking stills, contg. coke-like material, is stirred by sweeping it back and forth on the still bottom, after removal of the liquid oil, in order to permit the wet mass to dry and this dried material is then removed from the still.

Destructive distillation of wood. O. F. STAFFORD. U. S. 1,380,262, May 31. Wood undergoing destructive distn. is continuously supplied to the distn. retort and, after the initiation of the process, the heating is effected by the exothermic wood-carbonizing reaction.

23—CELLULOSE AND PAPER

A. D. LITTLE

Researches on cellulose and its esters. II. The stability and viscosity of the nitrocelluloses. J. DUCLAUX. *Bull. soc. chim.* 29, 374-82 (1921); cf. *C. A.* 14, 3154.—This study was made on 47 samples of nitrocellulose from different sources and of different usage. All samples were previously dried in an oven at 35° and then heated at 100 or 110° from $\frac{1}{2}$ to 23 hrs. The resulting loss in wt. was detd. and the decrease in viscosity of an acetone soln. of each sample, as compared with a soln. of a check sample, was obtained in an Ostwald viscosimeter after standing for 24 hrs. Conclusions: (1) When nitrocellulose is heated the viscosity of its solns. decreases and this decrease is an absolutely general fact; (2) there is a direct relation between the decrease in viscosity and the loss in wt. of the cellulose and practically, one of these values is sufficient to fix the other; (3) the study of the variations of viscosity during prolonged heating gives a very good method of following the decomprn. of a nitrocellulose and consequently its stability; (4) the method of detg. the stability based on the measurement of viscosity presents noteworthy advantages over current methods without apparent loss of sensibility.

R. L. BROWN

Behavior of the incrustations of cellulose upon treatment with mercerizing liquor (α -cellulose determination). CARL G. SCHWALBE AND ERNST BECKER. Eberswalde. *Zellstoff u. Papier* 1, 93-4 (1921).—In the detn. of α -cellulose by the action of 17.5 % NaOH upon chem. pulp, considerable amts. of materials contg. pentosan are dissolved out. The pulp thus obtained is not completely stable against further treatment with strong NaOH, but contains a certain amt. of easily hydrolyzed material. The result of the treatment of wood pulp with strong NaOH is not only to decrease the pentosan content but also the Me no. Complete analyses are given of 6 samples of pulp.

C. J. WEST

Accidental double refraction in celloidin and in cellulose. H. AMBRONN. Univ. Geneva. *Nachr. Kgl. Ges. Wiss. Göttingen, Math. Physik. Klasse* 1919, 299-320.—The accidental double refraction of celloidin and the cellulose prep'd. from it is dependent upon the refractivity of the liquids with which these compds. are satd. The value for the double refraction of celloidin may be positive, negative and also 0; in the case of cellulose, the value is always positive and never 0. In order to explain the results, there is assumed a combination of the double refraction of rods (Stäbchen) as proposed by Wiener (*C. A.* 6, 950) with the proper double refraction of the rod-like particles; the proper double refraction has a negative sign in the case of celloidin, a positive sign in the case of cellulose. Not only is the accidental double refraction in both compds.

a remarkable instance of double refraction of rods, but it also appears to be a confirmation of Nägeli's theory of cryst. micellae. The strong dichroism shown by the natural fibers as well as by the permanently stretched celloidin and cellulose strips likewise confirms the correctness of Nägeli's supposition.

C. J. WEST

Identification of oxycellulose by means of the barium compound. ERNST BECKER. Eberswalde. *Zellstoff u. Papier* 1, 5-7(1921).—When 2 g. of oxycellulose are shaken with 50-60 cc. $\text{Ba}(\text{OH})_2$ soln. for 4 hrs., and the insol. part washed is with H_2O until the filtrate is free of Ba, a Ba compd. of oxycellulose is formed; the Ba content of this compd. from bleaching-powder oxycellulose is 2.18%, from KMnO_4 oxycellulose, 1.46%, of H_2O_2 oxycellulose, 0.34%, of normal bleached sulfite pulp 0.20%. The method is not adapted to cellulose in the form of slime because of the impossibility of removing the adsorbed Ba.

C. J. WEST

The action of alkalies and alkaline earths upon spinning fiber cellulose (rag digestion). HERMANN GRIMM. *Zellstoff u. Papier* 1, 7-10, 33-56(1921).—Results of analyses (H_2O ash, furfural, pentosan, Et_2O ext. and alc. ext.) are given for unbleached and bleached cotton, linen and hemp pulps. In detg. the absorptive capacity of the fibers 10 g. air-dry material (H_2O content known) were shaken with 1 l. of the alkali for 4 hrs., the cellulose was filtered off and the liquor titrated with 0.1 N HCl and methyl orange. The difference between this value and the titration of the fresh liquor gave the amt. absorbed. The results show that time plays a role in the absorption, the greatest values being for 4 to 6 hrs. The higher the concn. of alkali, the greater the amt. absorbed. Stirring during the expt. increases the absorption of lime by cotton, but is unfavorable in the case of other alkalies and fibers. The alkaline earths are markedly absorbed while the alkalies are taken up only in small amts. SrO and especially BaO are absorbed to a greater extent than CaO . In general the absorption appears to increase with the degree of lignification. Cooking expts. in which 5% CaO was used showed that 88% of this amt. was utilized. Expts. in which the rags and CaO were allowed to stand 4 hrs. before heating (absorption) gave no better results. The cooking process is incomplete when pressure is lacking. The passage of CO_2 through the digester, with the idea that the $\text{Ca}(\text{OH})_2$ within the fiber might be transformed to CaCO_3 and thus rupture the fiber bundles, was ineffective. Cooking with Na_2CO_3 after absorption of CaO , which would cause the action of NaOH within the fibers, was no more efficient than the ordinary cooking process. The mechanical action of the hollander has a considerable effect upon the chem. constituents of the fibers, an effect that cannot be replaced by more severe cooking conditions. Comparative factory expts. with lime and lime-soda cooks were favorable to the former. In testing the quality of pulps the Me no. is valuable, but too costly for a control method. The lignin value is also a criterion of the purity of the cellulose. The relation of total impurities to cellulose may be detd. by the Ac no., since the cellulose forms sol. Ac derivs., while the lignified part and other impurities are undissolved. 1 g. air-dry material is treated with a mixt. of 5 g. Ac_2O , 5 g. AcOH and 0.15 g. H_2SO_4 (d. 1.84) and allowed to stand 24 hrs., with frequent shaking during the 1st 6 hrs. The mixt. is then diluted with 15 cc. of the acetylating mixt. and centrifuged. The height of the ppt. is read on a scale and converted to % of the original material. A list of 34 references on rag cooking is given.

C. J. WEST

Digestion of wood, especially by the sulfite process. CARL G. SCHWALBE. *Zellstoff und Papier* 1, 11-15(1921); *Paper* 28, No. 18, 15-17, 26(1921).—See *C. A.* 15, 1992.

C. J. WEST

Lignosulfonic acid. PETER KLASON. Stockholm. *Zellstoff u. Papier* 1, 56 (1921).—K. criticizes the formula proposed for the Ba salt of lignosulfonic acid by Höning and Fuchs (*C. A.* 14, 3410) and proposes $\text{C}_{13}\text{H}_{20}\text{O}_{10}\text{S}\text{Ba}$ in place of the formula $\text{C}_{13}\text{H}_{20}\text{O}_{10}\text{S}\text{Ba}$.

C. J. WEST

Schubert's tester for the degree of beating. WILLY GRÜNEWALD. *Zellstoff u. Papier* 1, 21-3(1921).—An app. is described and pictured for testing the degree of beating of pulp.

C. J. WEST

Bibliography of papermaking, 1st quarter, 1921. CARL G. SCHWALBE. *Zellstoff u. Papier* 1, 77-80, 106-108(1921).—This is confined principally to the German literature.

C. J. WEST

Removal of offensive gases in the sulfate pulp mill. CARL G. SCHWALBE. Eberswalde. *Zellstoff u. Papier* 1, 69-72(1921); *Paper* 28, No. 24, 13-15(1921).—After discussing the various methods which would have been proposed for the removal of the offensive gases of the sulfate mill, S. states that, according to Ger. pat. 319,594, wood acts as a catalyst for the reaction between Cl and the S-containing compds. of the waste gases, so that an almost completely inoffensive gas is produced. At the same time the wood collects the Na compds. from the flue dust, which may be recovered by extn. When the wood loses its catalytic properties, it may be used in the sulfate process in the usual way.

C. J. WEST

Thread paper. R-r. *Kunststoffe* 10, 86-89(1920).—Some 33 uses are given for paper which is reinforced by the use of threads or wire.

C. J. WEST

The filtration of water in paper mills. H. LIHOMME AND M. ARGY. *Papeterie* 43, 634-8(1921).—A description of the Gail and Noël Adam water filter and of its method of operation, together with a comparison of its cost against that of a sand filter, showing great advantages of the former both as regards first cost and cost of operation.

A. P. C.

The treatment of rags: Defibering and shredding. PORPHYRE. *Papeterie* 43, 626-33(1921).—A discussion of the merits of shredding rags before cooking them, instead of defibering them after cooking, showing that there is greater production, lower consumption of fuel, chemicals and power, and lower initial cost for the equipment.

A. P. C.

Rosin sizing. RUDOLF SIEBER. Kramfors. *Zellstoff u. Papier* 1, 15-14, 65-69 (1921).—The behavior of a free rosin suspension against various electrolytes is reported. This suspension is ppts. by a concn. of 2.61 millimol. per l. of $\text{Al}_2(\text{SO}_4)_3$. Since Ca salts ppt. in a concn. of 25 millimol. per l. and Mg salts in concns. of 15 millimol. such a free rosin suspension is perfectly stable towards hard water. The 2nd article discusses the suspension from the standpoint of colloidal chemistry the size of the particles, and the adsorption by various halfstuffs. 100 g. pulp adsorbed from 0.09 to 0.18 g. rosin.

C. J. WEST

Significance of "lignin" color reactions (CROCKER) 11B. Nitrocellulose composition (U. S. pats. 1,380,258 and 1,379,596) 5. Adhesive for use on wall paper (U. S. pat. 1,380,568) 18. Photo-elasticity for engineers. The stress-strain properties of nitrocellulose and the laws of its optical behavior (COKER) 2.

WARDEN, EDWARD CHAUNCEY: *Technology of Cellulose Esters*. London: E. et F. N. Spon, 57 Haymarket. For review see *Chimie & industrie* 123, 130(1921).

Waterproofing composition. T. SHIBATA and E. OE. U. S. 1,380,428, June 7. A waterproofing compn. adapted for use on paper is formed of Al acetate and saponified vegetable oil, e. g., "Marseilles soap" and H_2O_2 .

Cellulose acetate solution. W. T. SCHEELE. U. S. 1,379,699, May 31. Cellulose, e. g., cotton, is treated with a mixed soln. of H_2O_2 and NaOH in order to render it more sol. and the product, after being washed free from alkali, is acetylated with Ac_2O , HOAc and AlCl_3 . The product gives solns. of high viscosity.

Cellulose xanthogenate solutions. I. LILIENFELD. U. S. 1,379,351, May 24. A viscose soln. is heated to a temp. of about 60-80° in order to ppt. a H₂O-insol. xanthogenate without the addition of precipitants. The ppt. is washed with H₂O and is then dissolved in caustic alkali to obtain a soln. for making threads or other articles on coagulation.

Mixed acids for nitrating cellulose. I. KRTSEK. U. S. 1,380,392, June 7. A mixed acid for nitrating cellulose is prep'd. by treating HNO₃ with SO₂, steam and air in order to form the requisite amt. of H₂SO₄ to produce a suitable nitrating mixt.

24—EXPLOSIVES AND EXPLOSIONS

CHARLES E. MUNKOE

Examination of primers and detonators. A. LANGHANS. *Z. ges. Schiess-Sprengstoffw.* 16, 49-52, 57-9(1921); cf. *C. A.* 15, 2985.—Qual. information as to the ingredients of primer and detonator compns. may be obtained by microscopic examn. The use of a black glass slide (coated with asphaltum) is helpful, rendering the Sb₂S₃ almost invisible and permitting ground glass particles to reflect light strongly. For quant. examn. the entire cap or detonator, including the metal capsule, is dissolved in approx. 32% HNO₃ on a steam bath, the soln. evapd. to dryness, taken up with HCl, the powd. glass, charcoal and S filtered off, H₂S passed through the filtrate and the ppt. of sulfides examined for Hg, Cu and Sb. K in the filtrate is detd. as K₂SO₄ by evapn. with H₂SO₄. The same general method is applicable to both primers and *blasting caps*. The usual blasting cap composition in Germany is approx. 85% Hg(ONC)₂ and 15% KCIO₃. By the method described a cap contg. 1.29 g. Hg(ONC)₂ and 0.21 g. KCIO₃ showed on analysis 1.3888 g. Hg(ONC)₂ and 0.2269 g. KCIO₃. C. G. STORM

Recent work on propellants and blasting explosives. MEHREN. *Z. ges. Schiess-Sprengstoffw.* 16, 65-7, 74-5(1921).—A bibliography of the *literature of explosives* in the past five years, classified according to subjects as follows: Historical, general, manuf., storage and transportation, dynamite, picric acid, TNT, azides, etc., analysis, liquid air explosives, mercury fulminate, ignition, use of explosives, decomprn. of explosives, miscellaneous.

C. G. STORM

Experiments with blasting caps containing less than 80 percent mercury fulminate. A. LANGHANS. *Z. ges. Schiess-Sprengstoffw.* 16, 71(1921).—Owing to the scarcity of Hg, attempts were made during the war to reduce the Hg(ONC)₂ content of detonator compns. below the 85% used in Govt. manuf. or the 80% used in private German plants. Tests on 7 mm. Pb plates of caps contg. from 85% Hg(ONC)₂ and 15% KCIO₃ to 60% Hg(ONC)₂ and 40% KCIO₃ are tabulated, showing top and bottom diams. of the perforations made in the plate by the detonations, or depth of depression if perforation was not complete. These results show the 85/15 mixt. more effective than the 80/20. In ten tests with each mixt. the number of failures to completely perforate the plate were as follows: with 85/15 mixt. -0, 80/20 -0, 75/25 -2, 70/30 -6, 65/35 -10, 60/40 -10. It was considered impracticable to reduce the content of Hg(ONC)₂ below 80%. C. G. STORM

Effect of lightning striking an acid tank. PHILIP DEWOLF. *Chem. Met. Eng.* 25, 336(1921).—On June 1, 1920 lightning struck a vertical acid tank, 20 X 12 ft., holding 200 tons of 89% H₂SO₄, at the Old Hickory Powder Plant. The top of the tank was bulged out 9 in. and all casting fittings were broken but not a rivet was started or a seam opened. The bulge outward indicated an internal explosion of H, from the action of the H₂SO₄ on the Fe, mixed with air, and as the previously painted top of the tank was found coated with smooth oxide it had evidently been heated to or above the ignition temp. of a H + air mixt. The acid escaped through the broken fittings. C. E. M.

Incendiaries in modern warfare. I. II. ARTHUR B. RAY. *J. Ind. Eng. Chem.* 13, 641-46, 714-22 (1921).—Part I deals with incendiary materials and treats of properties and uses of P, thermite, O-agent-combustible mixts., flammable materials used as such, solid oil, and spontaneously flammable liquids. In Part II the following devices are described, with numerous illustrations, the compn. of German materials being frequently given: small arm ammunition, shell, trench mortar projectiles, grenades and other hand devices, aircraft bombs, flame projectors, the incendiary blue pencil, cans for dissipating gases in dugouts, devices for destroying airplanes, and flame flooding device for trenches.

CHARLES E. MUNROE

The stability of nitrocellulose powders. R. FRIC. *Compt. rend.* 173, 82-4 (1921).—In 1912 F. suggested the measurement of the viscosity, or rate of flow of acetone solns. of nitrocelluloses and its powders to det. the extent of changes effected in them (*C. A.* 6, 2331). The same year D. Berthelot and Gaudechon announced that smokeless powder was decomposed by exposure to ultra-violet rays (*C. A.* 6, 2530). F. now gives results of observations on samples of nitrocellulose powder exposed under different fixed conditions to ultra-violet rays for known times and of samples exposed to temps. of 15°, 60°, 85°, 92° and 100° up to 8 days with observations taken at known intervals using a d'Arsonval-Dewar flask as a thermostat and a viscosimeter of the Ostwald type with which to measure the rate of flow. Of the data for samples exposed to ultra-violet light it is said that after a rapid descent during the first hour there follows a regular diminution in viscosity with time of exposure corresponding to a constant velocity of transformation, and of that for samples exposed to different temps. for different times that curves plotted from the observations show during the first hour a rapid fall and then become rectilinear.

CHARLES E. MUNROE

Explosion of the blowing cylinder on a blast furnace blowing engine at Eisenerz. HANS AUGUSTIN. *Z. angew. Chem.* 34, Aufsatzteil, 117-20 (1921).—On Dec. 15, 1916 the blowing cylinder on a 3000-h. p. blowing engine at Eisenerz, Austria, was burst its full length, the explosion occurring just as "pouring" began at the furnace. It seems likely that the explosion was due to a mixt. of blast furnace gas and air, though oil gas or vapor may have found its way into the cylinder.

CHARLES E. MUNROE

Alcohol fumes explode at Abbott Laboratories. ANON. *Chem. Met. Eng.* 25, 343 (1921).—While producing high proof alc. by the CaO method by means of a Stokes rotary vacuum drier, a dust trap and distn. column, the drier being heated by steam and the agitator driven by an open elec. motor with knife switch, a leakage of alc. vapor resulted apparently from clogging of the pipe band between the trap and the column with lime dust. As soon as this escape of alc. and water vapor was observed the steam was cut off and the elec. switch pulled, a violent explosion immediately followed, initiated, probably by a spark or arc from the brushes on the motor commutator, the knife switch, or the starter contact as it passed over the segments. As a result of this explosion at the Abbott Labs., Chicago, on Aug. 8, 1921, 6 operators were injured, 2 fatally, the fire doors on the nearby elevator shaft and the other side of the room 50 ft. distant were blown down and the windows shattered. The new plant being erected in these labs. will have fireproof compartments and the elec. app. will be in sep. chambers from the process machinery.

CHARLES E. MUNROE

The use of nitroglycerin spent acid as charging acid for nitric acid stills. S. G. NORTON. *J. Ind. Eng. Chem.* 13, 677-8 (1921).—For some years it has been a custom in America to take spent acid freed from nitroglycerin by standing and skimming, fortify it with fuming H₂SO₄ to the desired strength and charge it in place of 66° Bé. H₂SO₄. This fortified spent acid contained 4% HNO₃. After using this charging mixt. for several months it was noted a consistently lower yield was obtained than with 66° Bé. H₂SO₄, the nitrosyl content of the mixed acid increased and that

poor sepn. obtained in the nitroglycerin operations. The distns. with spent acid charging *mixt.* took longer than with straight charging *mixt.* and 2.75% of the total yield of the first was in the form of NO_2 as against 0.40% for the last. The loss was in form of NO , N_2O , and N . Variations in proportions of the spent acid mixts. made no improvement and the use of spent acid for this purpose was abandoned. C. E. M.

The relation between composition of "mixed acids" and their specific gravities. ELWYN ROBERTS. *J. Soc. Chem. Ind.* **40**, 165-6T(1921).—This is an extension of the work of Sapsochnikoff (*J. Russ. Phys. Chem.* 1903 to 1905) and of Pascal and Garnier (*C. A.* **13**, 3049). The latter find that for "mixed" acids of which the compn. lies in the zone of those used for the nitration of cotton the sp. gr. is almost solely a function of the water content but do not state the nature of the function. By using HNO_3 freed from N oxides by a current of CO_2 mixts. were made all of which contained less than 0.02% of HNO_3 . The curves of sp. gr. plotted from these show that when the HNO_3 content is kept const. the sp. gr. is almost exactly a linear function of the water content. If the perpendicular distances of the 5 curves presented are plotted from their origins against the HNO_3 content corresponding to each curve, a curve is obtained which shows that the perpendicular distance is almost a linear function of the HNO_3 content. Curves similar to those shown would be of technical use in the rapid analysis of mixed acids. If the HNO_3 content were detd. by the nitrometer and the sp. gr. by a Twaddell's hydrometer reference to the figure would give the complete analysis of the acid.

CHARLES E. MUNROE

A note on the calculations involved in the preparation of acid mixtures for the manufacture of nitrocotton. B. A. FOWLER. *J. Soc. Chem. Ind.* **40**, 166-7T(1921).—It is the practice at some factories to give the refuse acid from the manuf. of nitrocotton a preliminary treatment with oleum and HNO_3 ; this brings its compn. near to the specified compn. for nitrating acid. This "balked" acid is then corrected by the addition of calcd. quantities of HNO_3 , oleum or refuse acid. F. presents a simplified method of using the graphs employed at H.M. Factory, Gretna, for calcg. the proportions of these ingredients and illustrates its use by examples from practice. C. E. MUNROE

TNT for road building. THOMAS H. MACDONALD. *Chem. Met. Eng.* **25**, 331 (1921).—TNT is an ideal explosive for use in road construction. As it does not freeze and the fumes do not produce headaches it is popular with road contractors. 26,000,000 pounds have been distributed for this use by the Bureau of Public Roads without an accident.

CHARLES E. MUNROE

The chemistry, manufacture and uses of nitrocellulose. HUGO SCHLATTER. *Chem. Met. Eng.* **25**, 281-86(1921).—This is an outline review with illustrations of app. and devices used in the manuf.

CHARLES E. MUNROE

Trinitrotoluene as an industrial poison (HAMILTON) 11H. Extinguishing coal fires (IMMERSCHITT) 21. The stability and viscosity of the nitrocelluloses (DUCLAUX) 23. Trinitrotoluene poisoning (LEWIN) 11H.

Propellant explosive. R. G. WOODBRIDGE, JR. U. S. 1,379,073, May 24. The surface of grains of nitrocellulose powder is impregnated with a dialkyldiarylurea by mixing the materials and subjecting them to the action of hot H_2O .

Igniting compositions for matches. O. J. MELLGREN. U. S. 1,379,355, May 24. The usual binding substances employed in match compns. are partially substituted by the powdered bark of *Pinus sylvestris* which supplies sufficient adhesive qualities and facilitates the taking up of air for ignition by the compn.

Armor-piercing, spotlight and incendiary projectile. W. L. CLAY. U. S. 1,380,773, June 7. Structural features.

25—**DYES AND TEXTILE CHEMISTRY**

L. A. OLNEY

Natural indigo. W. R. G. ATKINS. *Science Progress* 16, 56-70(1921).—A full description is given of the culture of the indigo plant, and of the manuf. of indigo from it by steeping, beating the aq. ext. (to oxidize the indoxyl to indigotin or indigo blue), boiling, filtering, and drying. Apparently application of a liberal amt. of nitrogenous fertilizer tends to lower the indican content of the plant, while a supply of other required elements, *e. g.*, P, under conditions which favor the formation of root nodules, produces an increased crop without any serious decrease in the indican content. When the soil contains a large amt. of readily available N compds., the indican content of the leaves is low. If wheat be used as a cover crop with the indigo plant under these conditions, the wheat utilizes the N compds. of the soil, and an indigo plant with high indican content is obtained. As the plant grows, its indigo content increases with its age up to a certain point, but decreases during the formation of the seeds. No indication of its indigo content is obtained by morphological examn. of the plant. Improvement is to be sought in the selection of especially vigorous plants, rather than in selection aiming at the production of a variety especially rich in indican. The duration of the fermentation, which occurs during the steeping, depends upon the bacterial content of the water used, upon the number of indican-splitting organisms present in it, and upon the temp. which should be at least 90° F. Several hours after water is placed upon the cut plants in the steeping vats, N₂ is evolved, then H₂, and finally CO₂. Apparently the CO₂ renders the protoplasm of the cells permeable, and thereby causes diffusion of the indican, which is then attacked by the bacteria with the liberation of indoxyl. The final acidity of the ext. is due to CO₂, no other volatile acids are present, and malic acid occurs only in traces, if at all. During this fermentation, alk. river water (*pH* 8.6) is changed to an acid reaction, at least *pH* 5.6 (the H-ion concn. of the leaf tissues). Over-steeping causes destruction of a portion of the indoxyl, and thereby gives rise to a decreased yield of indigotin. In order to obtain a max. yield, the fermentation is controlled by a simple test: 10 cc. of liquor are withdrawn from the vat, a few drops of NH₃ soln. are added, and the resulting soln. is shaken up with air to produce indigotin, and is then dild. to a vol. of 250 cc. The same test is made 30 min. later; and the blue colors of the 2 tests are compared. When the amt. of color no longer increases with time, the fermentation is stopped by drawing off the aq. ext. for beating. Normally the indigotin ppts. as formed during beating. If the fermentation has been abnormal, a green supernatant liquid may also be obtained. Under these conditions the yield of indigo is increased by addition to the liquor of a small amt. of dhak gum which causes flocculation and pptn. This gum, which is a ruby colored exudate of the dhak tree (*Butea frondosa*), is far superior to alum for this purpose. While natural indigo is usually marketed as a cake containing from less than 50% to 70% indigotin, it is also being produced as a paste. While natural indigo may ultimately be completely displaced by the synthetic product, yet the present high price of coal, raw materials, and labor in the manuf. of the latter insure to natural indigo a good chance of success as a paying concern for many years to come.

JOSEPH S. HEPBURN

The classification and identification of coal-tar colors. F. BORDAS. *Ann. fals.* 13, 193-437(1920).—Text of circular giving instructions as to the method to be employed for the identification of coal-tar colors for customs purposes, together with a table giving the following properties of the dyes: general aspect, color of aq. and of H₂SO₄ solns., behavior on dilg. H₂SO₄ soln., action of HCl and of alkalies, compn., material on which it is used, and remarks.

A. P.-C.

Microscopic characteristics of benzopurpurin. ANON. *Revue textile et des chimistes*

coloristes, Feb. 1921; *Industrie chimique* 8, 267(1921).—The microscopic characteristics of benzopurpurin vary according to the method of evapn. of the alc. or aq. soln. Micro-photographs are given illustrating this.

A. P.-C.

Impregnation of bagging, tenting and balloon materials to render them fireproof. WILLY HACKER. *Kunststoffe* 10, 61-4(1920).—H. reviews the literature of fireproofing, especially patents.

C. J. WISST

BEZOGL, WILHELM: *Die Farbenlehre im Hinblick auf Kunst und Kunstgewerbe.* Braunschweig: Fr. Vieweg u. Sohn. M 35. For review see *Z. physik. chem. Untericht* 34, 186(1921).

FOLTZER, J: *Artificial Silk and its Manufacture.* London: Sir Isaac Pitman, Ltd. For review see *J. Textile Inst.* 12, 297(1921).

GANSWINDT, ALBERT: *Dyeing Silk, Mixed Silk Fabrics and Artificial Silks.* London: Scott, Greenwood and Son.

LANGE, OTTO: *Die Schwefelfarbstoffe, ihre Herstellung und Verwendung.* Leipzig-Reudnitz: Otto Spamer.

WATSON, WILLIAM: *Textile Design and Colour.* 2nd Ed. London: Longmans, Green and Co. 436 pp. 21s.

Dissolving dyes. H. A. FOLSOM. U. S. 1,379,175, May 24. Vat colors and S colors are mixed with H_2O , an alkali such as NaOH and waste sulfite liquor, in order to dissolve them preparatory to dyeing or printing.

Tungsten lakes. A. LINZ. U. S. 1,378,882, May 24. Color lakes are prepd. by pptg. a coloring matter such as "crystal violet" with a sol. W compd., e. g., Na tungstate, together with Na_2HPO_4 and HOAc.

Embossed fabric. R. E. SHINER. U. S. 1,379,703, May 31. In the manuf. of rugs, carpets, etc., a layer of fibrous material such as jute waste is attached to a layer of burlap or similar woven material by pricking the fibers of the fibrous material into the woven material. The fabric is then immersed in casein, glue or water-glass, allowed to dry and embossed by heated rolls.

Cleansing textile fibers. C. BENNERT. U. S. 1,379,381, May 24. Cleansing of textile fabrics such as woolen goods is effected by the action of an albumose cleansing compd. derived from casein or similar substances with NaOH.

Treating fabrics for hats. L. HERMAN, JR. U. S. 1,379,341, May 24. A foundation material for making hats is formed by treating "flannelette" or a similar fabric with a soln. formed of Pb acetate, alum and H_2O and then with a soln. of shellac in MeOH.

Apparatus for making emulsions for treating raw silk. T. WICKERSHAM. U. S. 1,380,282, May 31.

26—PAINTS, VARNISHES AND RESINS

A. H. SABIN

The chemistry of paints and varnishes. R. S. MORRELL. *Chem. Age* (London) 4, 497-9(1921).—Oxidation of linseed oil is accompanied by an increase of 17.9% in wt., 14.3% in d., 3% in vol. After 3 mos. the increase in wt. has dropped to 10.3%; d. has risen to 18.6%; and vol. has dropped to 7% less than that of the original oil. The general theories of the action of driers, and the properties of paints and varnishes are reviewed. M. attaches considerable importance to the detn. of the H_2O -absorbing power of paint and varnish films. The whitening of varnish films on immersion in H_2O is due to formation of an emulsion; the film acts as a semi-permeable membrane

but there is no penetration of ions of the salts present. There are indications of a surface absorption of certain metallic ions by the film especially in the case of Ca, and in this respect the varnish films resemble casein or gelatin. F. A. WERTZ

Satin whites. A. COBENZL. *Farben-Ztg.* 26, 2018-20(1921).—See *C. A.* 14, 3801. F. A. WERTZ

Selecting varnish and applying it to electric motors and coils. JOHN C. DOLPH. *Elec. World* 78, 375-7(1921).—A detailed survey of present practice. Characteristics of 16 varnishes are tabulated. C. G. F.

Turpentine or substitute. W. GUSNER. *Seifensieder-Ztg.* 48, 432-3(1921).—Referring to Lüdecke's article (cf. *C. A.* 15, 766) on shoe creams, G. declares that decalin as a substitute for turpentine has not yet been definitely established. Cf. *C. A.* 15, 2198. P. ESCHER

Soluble resins by the method of Melamid. M. JACOBSON. *Kunststoffe* 11, 105-6(1921).—Easily sol., low-melting resins may be obtained by esterifying the condensation product of pure or tech. $\text{Me}_2\text{C}_6\text{H}_5\text{OH}$ and formalin with $p\text{-Me}_2\text{C}_6\text{H}_4\text{SO}_2\text{Cl}$. These are light yellow in color, transparent, not sticky, odorless and stable towards warm soda or dil. acid or cold alkali and concd. acids, and are sol. in C_2H_6 and fatty oils. By using corresponding compds. of the CO_2H series, saponifiable products are obtained, which are suitable for the production of resin soaps in place of colophony. C. J. WEST

Recovery of zinc in the Martin oven as zinc oxide (MÜLLER) 9. The problem of the constitution of fossil organic matter and the relation of its solubility in organic solvents at atmospheric pressure and excess pressure to its natural mode of formation (ENGLER, TAUSZ) 2.

BERSCH, JOSEF: *Manufacture of Earth Colors.* Translated from the 3rd German ed. by Charles Salter. New York: D. Van Nostrand Co. 216 pp. \$3.00.

BOTTLER, MAX.: *Technische Anstrich-, Imprägnier- und Isoliermittel.* Würzburg: Verlagsdruckerei Würzburg. G.m.b.H. M 14.40, bound M 20.40. For review see *Kunststoff* 11, 109(1921).

CORRIGNIER, CH.: *Manuel du peintre, couleurs et vernis.* Paris: J-B. Bailliére et Fils, 19 rue Hautefeuille. For review see *Rev. prod. chim.* 24, 436(1921).

ROSE, FRIEDRICH: *Die Mineralfarben und die durch Mineralstoffe erzeugten Farbungen.* Leipzig-Reudnitz: Otto Spamer. M 30.

Paint. T. J. ETHEridge. U. S. 1,379,542, May 24. A paint adapted for use on iron or steel is formed of asphalt 30, graphite 15, crude oil 20, cement 10, linseed oil 5, gasoline 15 and turpentine 5 parts.

Paint vehicle. G. WITTY. U. S. 1,379,235, May 24. A vehicle for paints is formed of rosin 40, crude oil 30, paraffin oil 10, gasoline 9, Japan drier 5, Pb acetate 3, and S 2 parts.

Pigment carbon from vegetable pith. S. E. SEAMAN. U. S. 1,379,222, May 24. Pith from corn cobs or other similar vegetable pith is employed for the manuf. of pigment C.

Partial calcining of calcium carbonate. W. H. ALTON. U. S. 1,379,157, May 24. A product suitable for use as "whiting," "Spanish white" or "Paris white" is prep'd. by subjecting CaCO_3 in the form of limestone lumps to intense heat to disrupt it into minute particles and heating these particles for a sufficient time to change a portion of the mass from CaCO_3 to CaO , leaving the remainder in the form of CaCO_3 , grinding and treating with Na_2CO_3 soln., washing, drying and regrinding.

Composition for coating iron, steel or wood. A. C. HOLZAPFEL. U. S. 1,379,018 May 24. A mixt. adapted for coating Fe, steel or wood is formed of 30-40 pts. of pitch derived from the treatment of oils and fats, and 60-70 pts. by wt. of a tar-oil distillate or other hydrocarbon solvent. U. S. 1,379,019 relates to a similar mixt. contg. 20% or less of Ti oxide as an additional ingredient. Cf. *C. A.* 15, 737.

Wax-finish remover. J. F. HURLEY. U. S. 1,380,299, May 31. A compn. for removing wax from wood or other surfaces preparatory to application of varnish is formed of soap 8 oz., H₂O 1 qt., oxalic acid 1 oz. and denatured alc. 1 oz.

27—FATS, FATTY OILS AND SOAPS

E. SCHERUBEL

New methods in oil and fat refining. A. WEIS. *Seifensieder-Ztg.* 48, 500, 522-3 (1921).—W. describes first the old lime method for neutralizing free fatty acids in coconut oil and then describes 2 methods using NaOH: (1) *Vacuum method*.—The oil is neutralized with the proper amt. of caustic and the charge with it soap stock is dried in the vacuum app. in 2-3 hrs. at 110° and is filter-pressed, furnishing a light yellow mealy soap stock of 60% soap and 40% neutral oil which is sold as soap stock of 92% oil. (2) *Wet method*.—In this method the pptd. soap is dissolved by running hot H₂O into the charge and, after settling, the neutral oil is drawn off; but usually a considerable emulsion-layer is formed which causes much loss of neutral oil; it contains as much as 50% neutral oil after acidification. W. describes a com. scale expt. in which he dild. this emulsion with an equal vol. of H₂O and centrifuged it in a cream separator, a heavy oil-cream was obtained which contained 65-80% oil and which the next day yielded a clean sepn. when heated to 70° for a short time. W. also mentions the utilization of an accumulated stock of spent bleaching charcoal which he saponified by boiling with the calcd. amt. of caustic, filtered and acidified the filtrate, a dark colored fatty acid was obtained. An attempt to revivify the residual charcoal by ignition failed. P. ESCHER

Soy bean oil refining committee (A.O.C.S.) report. H. P. TREVITHICK. *Cotton Oil Press* 5, No. 1, 53-4 (1921).—Expts. on the reading of colors of soy bean oils by ordinary daylight and "daylight" lamps indicate that the lamp gives more concordant results. A series of readings with Lovibond glasses by 5 chemists on 4 samples of soy bean oil show better agreement where blue glasses are used with the usual reds and yellows but the committee does not recommend the addition of blue without further work.

H. S. BAILEY

Notes on coconut oil color. P. W. TOMPKINS. *Cotton Oil Press* 5, No. 2, 122 (1921).—The present rule for reading crude coconut oil basis 30 yellow is inadequate for many Manila type oils which range 8 to 20 red and yellow 50-100. The 30 yellow is satisfactory with oil 3-5 red for which the rule was designed but a change should be made in the Interstate and N. Y. Produce Exchange rules to permit any coconut oil exceeding 7 red on the basis 30 yellow to be read and reported basis 50 yellow, and on oil exceeding 11 red basis 50 yellow to be handled basis 70 yellow. H. S. BAILEY

Sampling coconut oil in tank cars. P. W. TOMPKINS. *Cotton Oil Press* 5, No. 2, 124 (1921).—The N. Y. Produce Exchange rule 4 which requires that tank cars of coconut oil must be heated to 110° F. before sampling should be changed. Since coconut oil melts at 74-80° and may darken if heated in iron vessels, the rule should read "heated not over 100° F." H. S. BAILEY

Olive oil production in Europe. A. DE FORD. *Cotton Oil Press* 5, No. 3, 32-33 (July 1921).—An illustrated description of the present day methods of pressing olives in France and Spain. H. S. BAILEY

Oil sampling committee (A.O.C.S.) report. R. W. PERRY. *Cotton Oil Press* 5, No. 1, 51-6(1921).—The fact that crude cottonseed oils drawn by samplers from tank cars and those from the refining kettles after the cars are unloaded are seldom alike is shown by a long series of analyses. The sediment in the bottom of a car is seldom drawn by a sampler in proper proportion to the total oil in the car. It is recommended that an official sampler be adopted by the Society. A type of sampler with a bottom valve which does not eject part of the sediment in closing is preferable. H. S. BAILEY

Damaged seed and seed analysis committee (A.O.C.S.) report. JOHN MALOWAN. *Cotton Oil Press* 5, No. 4, 38-40(1921); cf. *C. A.* 14, 3330.—The aim of this work was to make cottonseed analyses more simple and the results more uniform, in the hope that ultimately seed could be bought on its oil content. Mills do not care to know the % of hulls and meats in seed and it is recommended this detn. be dropped. Samples of seed were analyzed by a number of chemists using 4 methods for detn. of oil and of NH_3 in meats and hulls and on whole seed. The results given in detail along with the methods are insufficient to warrant the selection of any one procedure as official. Various laboratories' methods for calcg. the yield of oil and cake per ton of seed are also discussed. H. S. BAILEY

Cottonseed oil refining committee (of A.O.C.S.) report. G. W. AGEE. *Cotton Oil Press* 5, No. 1, 54(1921).—From the replies to a questionnaire with reference to methods actually used by the committee members in refining cottonseed oil the following conclusions are drawn: The rate of agitation during refining should be capable of variation. To fix the rate of stirring without specifying the style of paddle and size of cup is useless. The refining process is not amenable to a fixed procedure and the details of speed of stirring, temp. of finishing, strength of lye, etc., should be left to the skill of the individual. H. S. BAILEY

Chemical changes in cottonseed during heating in storage. JOHN MALOWAN. *Cotton Oil Press* 5, No. 4, 40-44(1921).—In a previous article (*C. A.* 15, 1412) are described the exptl. conditions under which cottonseeds were stored and allowed to heat. The percentage of H_2O , oil, total N, H_2O -sol. N, EtOH -sol. N, NaCl -sol. N, and a number of other nitrogenous substances, reducing sugars, total sugars, pentosans, and free fatty acid were detd. in cottonseed after various times of storage under different conditions. Decomposed and sprouted seed were also analyzed. The methods of analysis and results are given in detail. When seeds are damaged through heating the sugars and pentosans decrease, while the acidity increases, and the proteins become H_2O sol. The globulins become sol. in NaCl soln. When hulls heat the pentosans furnish the fuel and when these are used up the heating practically stops. H. S. BAILEY

Fluorescence in Chinese cottonseed oil. P. W. TOMPKINS. *Cotton Oil Press* 5, No. 2, 123(June 1921).—While fluorescence in vegetable oils may indicate the presence of mineral oil, with oriental cottonseed oil this is not true. During 10 years experience in handling from 3000 to 15,000 bbls. each season, T. has never found a Chinese cottonseed oil which when refined did not show some fluorescence. Many of the samples tested had been shipped from the Orient in clean 5-gal. tin cans and there was therefore no chance for contamination. H. S. BAILEY

Vegetable oil as a world product. R. D. OILAR. *Cotton Oil Press* 5, No. 1, 36-7 (May 1921).—A brief review of the oil industry in the U. S. and a discussion of its future. H. S. B.

Oil extraction committee's (A.O.C.S.) report. FELIX PAQUIN. *Cotton Oil Press* 5, No. 4, 35-7(1921).—Answers from 42 chemists taking part in the A.O.C.S. co-operative work show that the Butt type of extn. tube is satisfactory but that the officially recommended method of wrapping the sample for extn. in filter paper is objectionable. A 25 \times 50 mm. thimble wrapped in a 125 mm. sq. filter paper gives better results. Alun-

shake, allow to settle and siphon off EtOH layer and ext. again with 50 cc. of petr.-ether. Draw off water and add ext. to foots flask, make up to vol., shake, allow to settle, read vol., pipet out 50 cc., evap., dry and weigh. This gives free oil and free fatty acids. Add neutral EtOH and titrate with 0.1 *N* NaOH to det. free fatty acids. From the results by different chemists L. concludes that No. 30 EtOH is satisfactory for sapon., that an extn. method is as good as the official method (*C. A.* 14, 3331) and that it is unnecessary to dry the fatty acids in CO₂.

H. S. BAILEY

Economy in washing. J. LEIMDÖRFER. *Seifensieder-Ztg.* 48, 519-20, 539-41 (1921).—Grained soaps are the best washing compds. for cleansing effect, but not the most economical, because a certain amt. is lost through the hardness of the H₂O, the loss increasing with increasing hardness. On that account soap powders are more economical, the accompanying Na₂CO₃ softening the H₂O, thus making all of its soap content available for cleansing, provided the powder contains no free unsapon. fat, which has no cleansing action of its own and even uses up some of the soap for emulsification, and provided it is free from excessive H₂O—a mere ballast—and free from caustic alkali and water-glass, both injurious to the fabric. To combine an O-bleaching effect with the soap powder is desirable since practical tests have shown its harmlessness regarding destruction of fabric, but its cost is too great to be economical. L. summarizes the requirements of a high-grade soap powder which from a mfg. standpoint it is possible to produce, as follows: (1) Its base should be a fully saponified grained soap. (2) It must contain sufficient alkali to kill the hardness of the H₂O. (3) Its neutrality must be close to that of a grained soap. (4) It must not contain any water-glass or other injurious ingredients. (5) It must be free from excessive H₂O or filler. (6) It must be finely ground and evenly distributed. (7) It must aid the cleansing action by liberation of gas bubbles. (8) Its soap must readily swell in H₂O. (9) It must be protected against caking.

P. ESCHER

Washing compounds containing oxygen. W. G. *Seifensieder-Ztg.* 48, 497-9, 520-2 (1921).—Only Na perborate has retained its position in washing compds. to furnish O for bleaching. Washing compds. contg. perborates should, when used, first be dissolved in H₂O of 25°; the goods are then added and the whole is slowly heated to 60° at which temp. all available O has been given off. The latter's action is mechanical to some extent, the small gas bubbles loosening the dirt particles, and to a larger extent chem. by oxidizing some of the dirt and coloring matter, imparting finally a fresh odor to the finished goods. A great advantage lies in the fact that washing and bleaching is done in one operation while compds. contg. Cl require a special bleaching operation with several subsequent rinsings. Any Cu stain in the goods will appear as a red spot when finished. The disadvantage of perborate powders is their expense.

P. ESCHER

Sal ammoniac-turpentine washing compounds. H. KÜHL. Kiel. *Seifensieder-Ztg.* 48, 499 (1921).—While a mixt. of NH₄Cl with turpentine represents a cleansing agent, it loses its NH₃ when mixed with alkali carbonate as shown by K.'s lab. expts. in which the following mixt. was tested: 40 pts. soda ash, 40 pts. powdered soap, 10 pts. NH₄Cl and 10 pts. anhyd. Na₂SO₄. This mixt. was packed (1) in an ordinary paper bag, (2) in a parchment paper bag, and (3) in a parchment paper bag inside a varnished pasteboard container. No. 1 had lost 65% of its NH₃ after 1 mo. and only traces were found after 2 mos. No. 2 had lost 30% after 1 mo. and 87% after 4 mos., while No. 3 had retained 72% of its original NH₃ after 4 mos.

P. ESCHER

The application of colloidal sulfur for the manufacture of sulfur soap and sulfur soap. H. KÜHL. Kiel. *Seifensieder-Ztg.* 48, 400-1 (1921).—Lab. expts. are recorded in which colloidal S was used in place of ptd. S for prep. a S soap. Both, a strongly alk. soap and a neutral soap, reacted strongly with colloidal S to form an

alk. sulfide while pptd. S reacted feebly or not at all. Less colloidal S is required than of pptd. S to produce the same effect.

P. ESCHER

Manufacture of Eschwege soap. K. L. WEBER. Stockholm. *Seifensieder-Ztg.* 48, 449-51, 475-6(1921).—Eschwege soap is expensive, contains 8-11% carbonates for a corresponding amt. of other salts. ABSTR.), and consists of a mixt. of 2 different kinds of soap solns.; one is the "marble" or ungrained soap and the other is the "ground" or salted out soap. It is made by adding salts to a homogeneous soap which, notwithstanding this addition, is still homogeneous at boiling temp., but which solidifies in a partly sepd., 2-phased condition during cooling. The marble contains the fatty acids of low mol. wt. (caprylic, caproic, lauric and myristic acids) and is poor in soap content, while the ground contains the fatty acids of high mol. wt. (stearic, palmitic and oleic acids) and is richer in soap. But even at boiling temp., the 2 phases show themselves by a lessened transparency. The added salts which cause the sepn. dissolve in the H₂O of the soap and at proper concn. begin to salt out the soap of high mol. wt. while that of low mol. wt. remains largely dissolved in the salt soln., each phase, however, being satd. with the soaps of the other phase; the viscosity of the marble is low; that of the ground is high. The marbling temp. is 80°. W. uses the following charge: 40% coconut oil, 30% tallow and 30% bleached palm oil, boiling and salting out the latter 2 soaps and adding them to the coconut oil mixt. which also contains the extra amt. of carbonate. W. gives many operating details regarding characteristics during boiling, the correction of faults, concn. of salt soln. and cooling in frames. While surprises are frequent when boiling these mottled soaps, W. reports only 2 failures out of 43 charges.

P. ESCHER

Transparent soft soap. H. A. *Seifensieder-Ztg.* 48, 476-7(1921).—Three soft soap recipes for fall, winter and summer are given for linseed oil and a mixt. of KOH and NaOH, also details for their boiling.

P. ESCHER

Vegetable oils as engine fuel (FORD) 21. Palm oil as motor fuel (LAZENNEC) 21. Industrial electroosmosis (ROWLINSON) 4.

Adressbuch für die Margarine-Industrie, Talg schmelzen, Speisefettfabriken und Ölraffinerien. Düsseldorf: Verlag Carl Foerster. For review see *Z. deut. Öl-Fett-Ind.* 41, 518(1921).

FARADAY, MICHAEL: *The Chemical History of a Candle.* Edited by W. R. Fielding. New York: E. P. Dutton and Co. 158 pp. 70 c. net.

Chilling and mixing fats. J. T. COX. U. S. 1,380,777, June 7. A liquid fatty material is continuously chilled in successive portions and the portions solidified by chilling are mixed with a main body of the fat to obtain a semi-solid suitable for use as a *lard substitute*. The method is especially adapted for use with hydrogenated oils.

Removing free acids from oils. F. O. RITTER. U. S. 1,379,045, May 24. Castor oil or similar oils contg. free fatty acids are treated with Na₂CO₃ soln. to form an emulsion; the oil and soap are salted out and the soap is washed out of the oil.

28—SUGAR, STARCH AND GUMS

F. W. ZERBAN

The 1920 Java sugar crop. H. C. PRINSEN-GEERLICS. *Intern. Sugar J.* 23, 393-400(1921).—Statistical data are given, including comparative chem. control data for the past decade.

W. L. OWEN

Preliminary studies on some fungi and bacteria responsible for the deterioration

of South African sugars. PAUL A. VAN DER BIJL. Dept. of Agr., Pretoria, Union S. Africa, *Sci. Bull.* 12, 1-32 pp.; *Intern. Sugar J.* 23, 320-3 (1921).—The fungi most commonly found in sugars are *Aspergillus*, *Stemphylium*, and *Sterigmatocystis*. Their morphology is discussed and results are given showing their ability to invert sucrose. With the exception of the *Stemphylium* species all cultures were capable of developing in 67 Brix sugar solns. None of the species studied was capable of withstanding an exposure of 15 min. to boiling water. The addition of 0.27 g. of NaF, 0.5 g. of NH₄F, or 4 cc. of a 5% soln. of NaHSO₃, or 12 cc. of 0.5% formalin, or 6 cc. of a 2% CaOCl₂ soln. (16% Cl) or 5% CaO to 50 cc. of mill juice entirely suppressed the growth of these fungi. The bacteria isolated from sugars are closely related to *Bacillus vulgaris* and *B. gummosis*. The relative humidity and temp. at Durban are highest during months in which sugars are stored. The best type of construction for warehouses for storing sugars and the use of steam in centrifugals are briefly discussed.

W. L. OWEN

Refining raw sugars commercially, using vegetable carbons. R. G. TILLERY. *Louisiana Planter* 66, 411-14; 67, 9-14 (1921).—The work described was done in a Louisiana cane-sugar house of 2,000 tons daily capacity. With certain modifications the same equipment was utilized for refining 1,000 bags of raws daily. The weighing, sampling, mincing and washing of the raw sugar was the usual procedure used in a bone black refinery. Five 40-inch centrifugals were used for washing the sugars. The washings and the runoff were sepd. at first but later combined, forming the raw washings. 5-6 gallons of water per centrifugal charge gave a washed sugar of 98.8 purity and raw washings of 80-82 purity with a yield of 14% of washing of 70 Bx. for every 100 part of raws. The washed sugar was melted in the sweet water to 40-45 Bx. at about 160° F. and strained into the tanks where defecation with lime and phosphoric acid occurred. This treatment removed 10-18% of the total color present. The liquor was blown up with air, passed through a Murphy juice heater and raised to 180° F. From there it passed through Taylor bag filters. The filtered juice was pumped to the C mixing tanks where the C was added at the rate of 5% on the weight of solids in the liquor. Thorough agitation and heating nearly to the boiling point followed. The decolorized liquor was pumped to filter presses and then flowed through a bag filter to catch any carbon which baked there. The carbon cakes were cut from the press cloths and carried to the mixing tanks for reuse. A later procedure of decolorization involved the mixing of a tank of liquor with its proper amt. of C and subsequent filtration. Untreated melted liquor was then pumped through the press until there was a noticeable fall in the decolorizing capacity of the C. The press was then sweetened off and the C revived. This cut the number of press changes to 1/4 of that required by the other method. The filtered decolorized liquor was slightly sulfured, concd. in the effects from 45° Bx. to 60° Bx. and then sent to the vacuum pans. With this No. 1 liquor of 98.5 purity 3 strikes were usually obtained before the color of the sirups became too dark. The purity of these sirups fell to a purity of 88-92. 100 parts of No. 1 liquor gave 81 parts of granulated and 19 parts remelts. On the basis of 100 parts raws there were 30.3 parts remelts as compared to 20-25 parts remelts in a bone char refinery. Acid-alkali and kiln revivification of the spent C were practiced. The acid-alkali treatment involved boiling the C for 1 hr. with 250 gal. of 2% HCl soln. The acid soln. was then dild. by adding water till the acid was about 0.2%, after which the C was removed in an iron plate and frame press. The C was washed carefully to remove all acid. The alkali treatment was made in an iron tank by using the NaOH as 8% of the wt. of water present. Following the boiling diln. to not less than 2% was made. Less than 2% gave a reabsorption of color by the C. After pumping into the press and subsequent washing, 0.1% HCl soln. was pumped through to ensure complete removal of alkali.

This was followed by washing until neutrality was reached. For heat revivification the spent C is dried in hoppers above the retorts to a moisture content of 20%. Scroll conveyors carry the semi-dry C through the upper retort to the rear end. Here it drops to the bottom retort and is carried forward to the front end and drops into a tank of water below. The time the C requires in passing through the retort is usually 2 hrs. The retorts are closed at all points with water seals. They require 1,500 lbs. of coke daily and are maintained at 1,000-1,100° F. for best results. The capacity of the kiln was 3,500 lbs. C per day. The acid treatment costs \$0.012 per 100 raws, the alkali treatment \$0.02625, the combined treatment \$0.03825. Reburning costs \$0.009187 per 100 raws. Burning alone costs less than is charged off for replacement value of bone char per 100 lbs. granulated refined. The highest type of control was maintained at all times. With the vegetable C refinery working under the present conditions, there is little difference in the cost of operation, and improvements in the C refineries will materially improve their results.

C. H. CHRISTMAN

The polarization of the normal sucrose solution. VL. STANĚK. *Listy Cukrovář.* 39, 341-50 (1921).—Bates and Jackson (C. A. 10, 2159) showed that the saccharimetric scale as used is in error, being 0.105° below 100° V. Herzfeld proposed that the results obtained by B. and J. can be explained by the possible contamination of the sucrose used by invert sugar produced during the concn. of the non-alk. sucrose soln. and by the action of microorganisms at the low temps. prevalent during concn. and crystn. In the study of this question S. used a Bates-Frič saccharimeter. The sucrose used was purified by the methods of Bates-Jackson, English chemists and Herzfeld (Lippman, *Ch. d. Zucker.* II, 1052). Moisture, ash and invert sugar content (method of Kraisy) were detd. The polarimetric readings were corrected for these factors as well as for errors in the vol. of the flasks used and for those due to the polarizing tube and the saccharimeter. The results show that the question raised as to the correctness of the saccharimetric scale is no doubt justified. The purest possible samples of sucrose give polarizations, after correcting for the effect of moisture, ash and invert content, below the required 100° V. by .083°. On a sample of sucrose, purified by one crystn. from an alc. soln., the polarization obtained was 99.904°. On further purification of the sucrose a polarization of 99.81° was obtained. The results on both cane and beet sugar were in close agreement. Repeated crystn. from alc. removed practically all the invert sugar added to a pure sucrose. Raffinose could not be removed by this double recrystn. as a result of which samples of sucrose containing it as an impurity gave abnormally high polarizations. As a whole the results obtained are even lower than those of Bates and Jackson.

JOHN M. KRNO

The neutral double polarization method for the determination of the sucrose Clerget. E. SAILLARD. *Louisiana Planter* 67, 124-5 (1921); cf. C. A. 15, 322.—S. directs attention to his original expts. for the application of the neutral double polarization to the detn. of sucrose in molasses. The study upon the effect of salts involved the use of NaCl, KCl, CaCl₂, Na₂SO₄, K₂SO₄, K lactate, AcOK and (AcO)₂Ca. The effect upon sucrose was an equal diminution of the rotation for all salts except Na₂SO₄ when equiv. concns. were used. The effect upon invert sugar gave an increased rotation to the left, proportional to the salt concn. and equal for all salts in equiv. concns., excepting Na₂SO₄. The effect of mixts. of salts was equal to the effects of each salt singly. The effect of salts upon asparagine and aspartic acid was identical with that upon sucrose and invert sugar. The effect of H₂SO₄, H₂SO₃ and H₂CO₃ in molasses is negligible as these are removed by Pb sub-acetate.

C. H. CHRISTMAN

Theory of the sugar refractometer for the determination of the apparent dry substance in sugar juices. OTTO SCHÖNROCK. Phys.-tech. Reichsanstalt. *Z. Ver. deut. Zuckerind.* 71, 417-40 (1921).—Reply to Krüss (cf. C. A. 15, 1827). The values of

nd calcd. by K. for sugar solns. contg. from 35 to 65% are certain to be erroneous, being obtained by a method of compensation for which there is no foundation in fact. Those for concns. above 65% are therefore less probable than those given by Main. The dispersion values calcd. by Krüss according to a similar method are likewise wrong. New measurements by S. have shown that the value for the dispersion of sugar solns. previously found by him is correct. Consequently the angles chosen for the double prism and for the compensator are also correct. Careful calcns. show that, up to a concn. of 70% sugar, the border line between the two halves of the field cannot possibly show visible coloration. The fact that the sugar refractometer gives correct figures is further substantiated by the results obtained by other observers who found close agreement between their observations and S.'s tables. The conclusion is justified that the data on which the construction of the sugar refractometer is based are uncontrollable.

F. W. ZERBAN

Process for the biological purification of sugar factory effluent, utilizing waste heat from the factory. HERBERT STENTZEL. *Deut. Zuckerind.* **46**, 427-8(1921).—The processes in use at present have not had the desired purifying effect because of a lack of temp. control which caused the microorganisms to become inactive in cold weather. The waste waters can be purified efficiently if the fermentation is carried out at the optimum temp. In the new process the waters are first freed from pulp by well known methods, and are then inoculated with lactic acid bacteria or with yeast in two well insulated iron tanks in which the water is kept at the necessary temp. by means of hot water coils and by injection of hot air. The coils are supplied with condensed steam and the hot air is aspirated from the hottest part of the boiler house. From the inoculation tanks the water is pumped into the 7 fermentation tanks which are also well insulated and kept at 40-50° for lactic fermentation and at 30-40° for yeast fermentation. Then it flows into 11 sedimentation tanks. The ppt. in these tanks is pumped out, pressed, and mixed with pulp to be sold as *fodder*. Cf. *C. A.* **15**, 2015.

F. W. ZERBAN

Chemical control results of Mauritius factories. ANON. *Intern. Sugar J.* **23**, 305-60(1921).—A table contg. figures on the chem. control of 20 Mauritian sugar factories for 1919.

W. L. OWEN

Further investigation on the causes of underdetermined losses. J. S. DE HAAN. *Arch. Suikerind.* **29**, 840-1(1921).—The close agreement between the sucrose loss and the loss in total solids, characterized as remarkable in a previous paper (*C. A.* **15**, 3224), was really to be expected on theoretical grounds, because total sucrose loss, minus non-sugar increase, necessarily equals the undetd. loss in total solids. The concordance found proved therefore only that no entrainment losses had taken place. But this being the case, the sugar deficit actually found must have been sustained either at or after the centrifugal station.

F. W. ZERBAN

Study of the fundamental laws of filtration, using plant-scale equipment (BAKER) 13. Table for the determination of dextrose, invert sugar and levulose according to the thiocyanate-potassium iodide method (BRUHNS) 7. Industrial electrosmosis (ROWLINSON) 4.

KAHN, ALLEN RAY: Sugar. Los Angeles, Cal.: U. S. Sugar Pub. Co., 102 W. 2nd St. 78 pp. \$2.00.

MOELLER-KRAUSE, WERNER: Practical Handbook for Beet-Sugar Chemists. Easton, Pa.: The Chemical Publishing Co. 132 pp. \$1.50 net.

Technology of Beet Sugar Manufacture. Denver: The Great Western Sugar Co 324 pp.

29—LEATHER AND GLUE

ALLEN ROGERS

The determination of sugar-like material in leather. JR. C. VAN DER HOEVEN. *Collegium* 1921, 220-4.—Comparison was made of the gravimetric method and a modification of the volumetric method of Schoorl (*Z. anal. Chem.* 1899, 633) and results by the 2 methods agreed well. The soln. was prep'd. and reduced in the usual (German) way, by the use of 20 cc. of Fehling soln. and a total vol. of 50 cc. After reduction the soln. was cooled quickly in water at a temp. not lower than 25°, and 3 g. of KI were dissolved in H₂O and 10 cc. of 25% H₂SO₄ were added. The free I₂ was then titrated with 0.1 N Na₂S₂O₃. Better results were obtained by using a total vol. of 100 cc. or 150 cc. for reduction and boiling for 4 or 8 min., resp., instead of for 2 min. I. D. C.

Analysis in tanning chemistry. GEORG GRASSER. *Collegium* 1921, 224-7.—I. For the *chem. control of deliming*, place 2-g. pieces of limed and unhair'd skin in 20 cc. of water contg. the necessary amt. of acid and 0.2, 0.3, 0.4, etc., g. of salt. After 2-3 hrs. titrate the soln. to det. whether sufficient acid has been used and press the pieces of skin between towels and weigh to det. which soln. has the least swelling action. II. In the *Br water test*, a moderate excess of Br will also ppt. pyrogallol tannins while a large excess will dissolve the catechu tannins. The test with HCHO-HCl may be rendered uncertain by a cloudiness due to phlobaphenes but these dissolve if the soln. is made strongly alk. while the methylene compds. remain insol. The change in color of the lime water ppt. from green to red or violet which occurs with galls, catechu, or mimosa takes place only under the influence of O so that it is necessary to bring the ppt. to the surface of the soln. The H₂SO₄ reaction characteristic of mimosa or quebracho is given by sulfited quebracho without the addition of acid when the dil. ext. is evapd. to dryness. III. Since *3-bath Cr liquors* contain both chromic salts and chromic acids, the total Cr is detd. with Na₂O₂, the chromic acid is detd. volumetrically with, for example, iron alum and dichromate and the Cr alum is found by difference. IV. In *analyzing the reducing bath for the 2-bath Cr process*, det. (a) total SO₂ with I₂, (b) total acid by titration, and calc. both as H₂SO₃. If *a* is less than *b* free H₂SO₄ is present, while if *a* is greater than *b* unchanged Na₂S₂O₃ is present. I. D. C.

Improving the tanning properties of lignosulfonic acid. S. V. HINTIKKA. *Finsk Pappers- u. Trävarutidskrift* 1920, 357; *Zellstoff u. Papier* 1, 102-3 (1921).—The tanning properties appear to be improved if the warm soln. is treated with a stream of air. C. J. WEST

Industrial electroosmosis (ROWLINSON) 4.

WEINER, FERDINAND: *Die Lohgerberei oder die Fabrikation des Lohgaren Leders.* (Vegetable Tannage or the Manufacture of Vegetable Tanned Leather). 3rd Ed. enlarged and improved. Vienna and Leipzig: A. Hartleben's. 518 pp. M 14.4. For review see *J. Am. Leather Chem. Assoc.* 16, 375 (1921).

WEINER, FERDINAND: *Die Weiszgerberei, Samischgerberei und Pergamentfabrikation.* 3rd Revision. Enlarged by Viktor Mikuska. Vienna and Leipzig: A. Hartleben's. 351 pp. M 24. For review see *J. Am. Leather Chem. Assoc.* 16, 375 (1921).

Treating leather substitute shoe counters. A. L. CLAPP. U. S. 1,380,865, June 7. Shoe counters formed of a leather substitute are treated with a 15% soln. of alum or Al₂(SO₄)₃ for preventing shrinkage.

30—RUBBER AND ALLIED SUBSTANCES

JOHN B. TUTTLE

Tetralin as reaction retarder in the manufacture of rubber substitute. RUDOLF DITMAR. *Graz. Z. angew. Chem.* **34**, Aufsatzteil, 355(1921).—By diln. of the vegetable oil with tetralin, (a mixt. of liquid hydro-naphthalenes) Ger. pat. 320,807, the reaction of the oil with S_2Cl_2 is materially retarded and the violence diminished. It has the advantage of mixing in all proportions with any drying oil. The use of tetralin was initiated in the attempt to conserve the supply of mineral oils in Germany. C. C. D.

The colloidal state and its relations to rubber. H. POTT. *Caoutchouc & gutta-percha* **18**, 10853-61(1921).—The history and present state of knowledge of colloid chemistry is outlined in detail. After describing the familiar phenomena peculiar to the colloid state, the process of obtaining rubber from its latex by coagulation and its action with solvents are correlated with the facts described. The article aims essentially to impress that a knowledge of rubber presupposes familiarity with colloids. C. C. D.

The sticking of rubber. A. DUOSC. *Caoutchouc & gutta-percha* **18**, 10911-3 (1921); *Rubber Age* **9**, 293-4(1921).—A summary of the little known work of Brindejone on the sticking of rubber, with addition of certain personal observations by D. After prep. a pure rubber from Landolphia, Brindejone studied the action of (1) sunlight; (2) diffused light; (3) heat without light; (4) $NaCl$ and (5) dil. $AcOH$ and $PhOH$. It was found that the rubber, when once affected even imperceptibly by any of the above, continues to deteriorate when the cause has been removed. This progressive action continues after the affected rubber has latter been vulcanized. Sunlight causes deterioration only when the rubber is in contact with the air. The rate is more rapid in moist than in dry air. Diffused light causes deterioration in proportion to its intensity and time and the action is a modification of sunlight. Heat with darkness causes sticking only when H_2O is present, and the rate is proportional to temp. Concns. of only a few thousandths of 1% of $NaCl$ in the dark cause sticking. The presence of alkalies and alk. earth chlorides in the sizing of fabric causes deterioration of the finished product. Traces of $AcOH$ and $PhOH$ cause sticking. Since $AcOH$ is used for coagulation, rubber should be examined for it. In general if sticking has not set in, deterioration may be prevented by thorough washing, but if it has appeared, it was impossible to retard it even with antisepsics like ClH_2O or $NaHSO_3$. C. C. D.

The use of serum to dilute latex. O. DE VRIES. *Arch. Rubbervult.* **5**, 279-95 (1921).—The use of serum for the purpose of diluting latex to standard rubber content gives rubber curing more quickly and less uniformly than does the use of water for the same purpose. Whereas diln. of latex with water reduces the rate of cure of crêpe (in the ratio, say, 105:120) as compared with the rate of cure of crêpe from undil. latex, diln. with serum leaves the rate unaffected; the rate of cure depending on the concn. of serum substances in the medium at the time of coagulation. G. S. WHITBY

The acceleration of vulcanization by organic accelerators. A. MAXIMOV. *Caoutchouc & gutta-percha* **18**, 10944-7(1921).—A very detailed but preliminary rept. of research in Moscow from 1914 to 1919. It includes (1) the necessity of the presence of certain metallic oxides with the accelerator, and their relation to S and to the accelerator for the optimum cure; (2) the cause and reactions involved in acceleration by derivs. of secondary aliphatic amines in the presence of metallic oxides; (3) detn. of the compds. formed by the reaction of $NHMe_2$ and CS_2 , together with the accelerating power of thiuram sulfide and disulfide. To cure successfully at 15-30 lbs. steam, it was necessary to use, based on the rubber, at least 0.75% S and 0.25% accelerator (independent of mol. wt.). ZnO increased the activity of the accelerator most, PbO next, 0.85% ZnO and 3.5% PbO was necessary to increase to its max. the activity of

the accelerator. MgO , CaO , BaO , Sb_2O_3 , $CaCO_3$, Sb_2S_3 , $PhNH_2$, $PhNMe_2$ and $PhOH$ were not active in increasing the power of the accelerator. The presence of acidic compds. like rosin destroyed the activity. $PhNH_2$, $PhNMe_2$ and $PhOH$ with PbO increased the activity. To det. the action of ZnO and of PbO , a mixt. of 5 g. of the addition product of $NHMe_2$ and CS_2 (A), 10 g. ZnO , and 15 g. S was fused at 130–50°. 3 g. of this with 100 g. rubber cured completely in 15 min. at 20 lbs. The theory of exothermic action by ZnO was rejected because this heat was liberated during fusion. The fusion mixt. was extd. with H_2O , Me_2CO , $EtOH$, CS_2 and $CHCl_3$. From Me_2CO was obtained a resin not analyzed. From CS_2 was obtained an unidentified compd., m. 116–8°. This last failed to cure rubber without S, but 4% of this, 4% S and 4% PbO effected a cure in 10 min. at 20 lbs. The cured rubber had a very significant yellow color; this shows that no PbS was formed. From $CHCl_3$ was obtained the greatest wt. of extract. Two unidentified compds. were isolated, one m. 127° the other m. 242–5°. Both compds. accelerated in the absence of ZnO and PbO . The second was zinc dimethylthiocarbamate, the first a mixt. of the second and S. Investigation of the compn. of A showed the presence of 3 compds., tetramethylthiourea (B), dimethylamine dimethylthiocarbamate (C), and tetramethylthiuram disulfide (D). B obtained by extg. A with $MeOH$ was a solid, m. 78.5°, b. 245°. The compd. 100 rubber, 3.5 S, 2 ZnO , 0.5 B failed to cure in 15 min. at 30 lbs. C obtained by dry distn. of A and crystn. from $MeOH$ and Et_2O was a solid, m. 132°. The compd. 100 rubber, 3.5 S, 2 ZnO , 0.5 C cured completely in 15 min. at 30 lbs. $Pb(OAc)_2$ with C gave a white ppt. E. The compd. 100 rubber, 3.5 S, 0.5 E failed to cure in 15 min. at 30 lbs., but addition of 4 PbO to this compd. gave a completely cured black rubber at the same cure. D obtained as residue in the dry distn. or $EtOH$ extn. of A was a solid, m. 150° (cf. *Ber.* 35, 820 and 36, 2275). The compd. 100 rubber, 3.5 S, 2 ZnO , 0.5 D completely cured in 15 min. at 30 lbs. $Pb(OAc)_2$ with D gave a white ppt. F, m. 190–2°, but ZnO gave no ppt. The compd. 100 rubber, 3.5 S, 0.5 F failed to cure in 15 min. at 30 lbs., but addition of 4 PbO gave a completely cured black rubber at the same cure. By evapg. an alc. KCN soln. of D (*Ber.* 36, 2280) tetramethylthiuram sulfide (G) was obtained, m. 108°. 100 rubber, 3.5 S, 3 ZnO , 0.5 G cured completely in 15 min. at 30 lbs. A usually contains approx. 50% of D, 30% of C and 20% of B. It is due to C and D alone that A owes its accelerating activity. Further research is to follow.

C. C. DAVIS

Experimental vulcanization on the small scale. D. F. TWISS AND S. A. BRAZIER. *Rubber Age* 9, 337–8 (1921).—A review of the merits of the small scale vulcanization app. of van Rossem (*C. A.* 12, 2260). By the use of an oil bath the vulcanization and immersion periods are commensurate with one another on account of the high thermal capacity of the oil. Exptl. results are, therefore, always more concordant than with steam. The range of temp. is much greater and the temp. is maintained practically const. The most efficient app. for vulcanizing many samples, at one time and continuously, is described.

C. C. DAVIS

Determining factors for the life of a pneumatic tire. WM. G. NELSON. *Chem. Met. Eng.* 25, 153–4 (1921).—Five factors influence the life of a tire, the rubber compd., the fabric, the construction, its vulcanization and the usage. In an elementary way is sketched the mixing of rubber compds., vulcanizing, optimum cures, tire construction and precautions to insure long life of a tire.

C. C. DAVIS

Apparatus for testing the hardness of the rubber rolls of typewriters. GEORGES MORARD. *Caoutchouc & gutta-percha* 18, 10924–5 (1921).—A contrivance has been developed for reading directly the hardness of vulcanized rubber. Essentially it consists of a clock gage with its stem sliding in a collar or sleeve attached rigidly to the gage. The point of this sleeve lies in the same plane as the point of the stem of the

gage. Gage and sleeve are attached by hinging to parallel lever arms so that motion shall always be perpendicular. The rigid system of clock gage and lever arm with its sleeve are weighted. When therefore the two are rested upon the test piece the rigid point alone sinks into the rubber. Since the stem point does not penetrate, the depth is recorded directly on the dial by the relative change in position of the 2 points. The basis of hardness is necessarily empirical.

C. C. DAVIS

The tannin in *Hevea brasiliensis* (ARISZ, SCHWEIZER) 11D. Aniline poisoning in the rubber industry (DAVIS) 11H.

Treating rubber latex. S. C. DAVIDSON. U. S. 1,380,640, June 7. A good grade of raw rubber is directly prep'd. from latex by treating the latex, in as fresh a condition as possible, with a dil. soln. of alkali metal phenolate to serve as a preservative, subsequently adding sufficient AcOH, H_2SO_4 or other acid to neutralize the alkalinity of the material, liberate phenol and leave the material slightly acid and cause coagulation, sepg. the coagulum from the mother liquor which contains most of the impurities and mechanically dehydrating the raw rubber thus obtained. Cf. *C. A.* 15, 2213.

Rubber substitute. J. C. WICHMANN. U. S. 1,379,149, May 24. A rubber-like product adapted for use in tires, shoe heels or other articles is prep'd. by macerating the fleshy parts of cacti, heating them, extg. the juice, concg. it, mixing it with Para rubber, linseed oil, asphaltum and S, and boiling, drying and oxidizing the mixt.

Rubber-like material. J. C. WICHMANN. U. S. 1,379,150, May 24. A rubber-like material suitable for general use as a rubber substitute is prep'd. by macerating the fleshy parts of the yucca plant, heating to above the b. p. of H_2O , extg. the juice, adding a catalyst contg. Na tungstate in order to vulcanize and strengthen it, concg., adding a soln. of Para rubber, linseed oil and a molten soln. of asphaltum and S, boiling, drying and oxidizing.

Rubber-compounding mixture. G. J. CHERTOFF. U. S. 1,379,743, May 31. A fluid mixt. adapted for preventing blooming and reducing or other deterioration of rubber is formed of palm oil, resin oil, pine oil or turpentine mixed with a resin or varnish gum, e. g., copal.

Vulcanizing rubber. C. W. BEDFORD. U. S. 1,380,765, June 7. A vulcanization accelerator such as $(CH_2)_8N_4$ or thiocarbamidine is dissolved in H_2O , alc. or other suitable solvent, mixed with compounding ingredients such as S and ZnO and this mixt. is added to rubber and the compd. is subjected to vulcanization.

Treating rubber articles with steam during vulcanizing. W. SEWARD. U. S. 1,380,425-6, June 7.

Apparatus for forming rubber articles by dipping and for recovery of solvents used. A. BOECLER. U. S. 1,380,862, June 7.

